Agilent 4285A Precision LCR Meter (Including Option 001, 002, 201, 202, 301)

Maintenance Manual

SERIAL NUMBERS

This manual applies directly to instruments whose serial number prefix is 3009J-, and whose ROM-based firmware is version 01.00. For additional important information about serial numbers, read CHAPTER 1, SERIAL NUMBER of the 4285A Operation Manual.

Agilent Technologies

Agilent Part No. 04285-90030
Printed in JAPAN April 2000

Second Edition

Notice

The information contained in this document is subject to change without notice.

This document contains proprietary information that is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced, or translated to another language without the prior written consent of the Agilent Technologies.

Agilent Technologies Japan, Ltd.
Component Test PGU-Kobe
1-3-2, Murotani, Nishi-ku, Kobe-shi,
Hyogo, 651-2241 Japan

©Copyright 1990, 2000 Agilent Technologies Japan, Ltd.

Manual Printing History

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates that are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

April 1990 ..... First Edition (part number: 04285-90030)

April 2000 ..... Second Edition (part number: 04285-90030)

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institution's calibration facility, or to the calibration facilities of other International Standards Organization members.

Warranty

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of one year from the date of shipment, except that in the case of certain components listed in *General Information* of this manual, the warranty shall be for the specified period. During the warranty period, Agilent Technologies will, at its option, either repair or replace products that prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies. Buyer shall prepay shipping charges to Agilent Technologies and Agilent Technologies shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent Technologies from another country.

Agilent Technologies warrants that its software and firmware designated by Agilent Technologies for use with an instrument will execute its programming instruction when property installed on that instrument. Agilent Technologies does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

Limitation Of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. Agilent Technologies specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

Exclusive Remedies

The remedies provided herein are buyer's sole and exclusive remedies. Agilent Technologies shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

For any assistance, contact your nearest Agilent Technologies Sales and Service Office. Addresses are provided at the back of this manual.

Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific *WARNINGS* elsewhere in this manual may impair the protection provided by the equipment. In addition it violates safety standards of design, manufacture, and intended use of the instrument.
The Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

Ground The Instrument

To avoid electric shock hazard, the instrument chassis and cabinet must be connected to a safety earth ground by the supplied power cable with earth blade.

DO NOT Operate In An Explosive Atmosphere

Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT Service Or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT Substitute Parts Or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument. Return the instrument to a Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

Dangerous Procedure Warnings

Warnings , such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

Warning

Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting this instrument.

Safety Symbols

General definitions of safety symbols used on equipment or in manuals are listed below.

Instruction manual symbol: the product is marked with this symbol when it is necessary for the user to refer to the instruction manual.

Alternating current.

Direct current.

On (Supply).

Off (Supply).

In position of push-button switch.

Out position of push-button switch.

Frame (or chassis) terminal. A connection to the frame (chassis) of the equipment which normally include all exposed metal structures.

WARNING

This **Warning** sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.

CAUTION

This **Caution** sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

NOTE

This **Note** sign denotes important information. It calls attention to a procedure, practice, condition or the like, which is essential to highlight.

HOW TO USE THIS MANUAL

This manual consists of Chapter 1 (Performance Tests). Chapter 1 provides the information to performance test the 4285A.

4285A Precision LCR Meter Documentation Map

Getting Started Guide

The Getting Started Guide walks you through system setup and initial power-up, shows how to make basic measurements and explains commonly used features.

Operation Manual

The Operation Manual provides general information, specifications, GPIB programing information, and in depth reference information.

Maintenance Manual

The Maintenance Manual explains how to verify conformance to published specifications.

Service Manual

The Service Manual explains how to adjust troubleshoot, and repair the instrument.

TABLE OF CONTENTS

CHAPTER 1. PERFORMANCE TESTS 1-1

1-1. INTRODUCTION 1-1

1-2. TEST EQUIPMENT 1-1

1-3. PERFORMANCE TEST RECORD 1-3

1-4. INITIAL OPERATING PROCEDURE 1-4

1-5. SYSTEM RESET 1-4

1-6. TEST FREQUENCY ACCURACY TEST 1-5

1-7. TEST SIGNAL LEVEL MONITOR ACCURACY TEST 1-6

1-7-1. Low Frequency Test 1-6
1-7-2. High Frequency Test 1-8

1-8. TEST SIGNAL LEVEL ACCURACY TEST 1-11

1-9. IMPEDANCE MEASUREMENT ACCURACY TEST 1-13

1-10. STORE AND LOAD FUNCTION TEST 1-24

1-11. HP-IB INTERFACE TEST 1-25

1-12. DC BIAS LEVEL ACCURACY TEST (OPTION 001 ONLY) 1-27

1-13. VOLTAGE RATIO MONITOR ACCURACY TEST (OPTION 002 ONLY) 1-29

1-14. ACCESSORY CONTROL INTERFACE FUNCTION TEST (OPTION 002 ONLY) 1-31

1-15. HANDLER INTERFACE FUNCTION TEST (OPTION 201 ONLY) 1-34

1-16. HANDLER INTERFACE FUNCTION TEST (OPTION 202 ONLY) 1-38

1-17. SCANNER INTERFACE FUNCTION TEST (OPTION 301 ONLY) 1-41

1-18. SUPPLYING DC POWER TO THE SIMULATOR 1-44

APPENDIX A. MANUAL CHANGES

A-1. INTRODUCTION A-1

A-2. MANUAL CHANGES A-1

Agilent 4285A Precision LCR Meter Maintenance Manual

Manual Change

Agilent Part No. N/A

June 2012

Change 1

Revised Minimum, Maximum & Measurement Uncertainty in Test Signal Frequency Accuracy Test.

Test Frequency	Minimum	Measured Value	Maximum	Measurement Uncertainty
100 kHz	99.990 kHz		100.010 kHz	1.00 Hz
149 kHz	148.985 kHz		149.015 kHz	1.49 Hz
1 MHz	0.99990 MHz		1.00010 MHz	10.0 Hz
10 MHz	9.9990 MHz		10.0010 MHz	100 Hz
16 MHz	15.9984 MHz		16.0016 MHz	160 Hz
17 MHz	16.9983 MHz		17.0017 MHz	170 Hz
30 MHz	29.9970 MHz		30.0030 MHz	300 Hz

Change 2

Revised Measurement Uncertainty in Test Signal Level Monitor Accuracy Test.

Test Frequency	Test Signal Level	Minimum[1]	Monitor Reading	Maximum[1]	Measurement Uncertainty
100 kHz	1 V				0.82 mV
1 MHz	20 mV				0.21 mV
1 MHz	100 mV				1.01 mV
1 MHz	1 V				10.1 mV
1 MHz	2 V				21.0 mV
3 MHz	1 V				8.8 mV
10 MHz	1 V				9.1 mV
30 MHz	1 V				18.2 mV

[1] Refer to Test Signal Level Monitor Accuracy Test - Calculation Sheet (pg. 1) in getting the minimum and maximum limit values.

© Copyright 2012 Agilent Technologies

Change 3

Revised Minimum, Maximum & Measurement Uncertainty in Test Signal Level Accuracy Test.

Test Frequency	Test Signal Level	Minimum	Monitor Reading	Maximum	Measurement Uncertainty
100 kHz	1 V	0.919 V		1.081 V	0.042 V
1 MHz	5 mV	3.580 mV		6.420 mV	0.210 mV
1 MHz	20 mV	17.32 mV		22.68 mV	0.840 mV
1 MHz	100 mV	90.6 mV		109.4 mV	4.200 mV
1 MHz	1 V	0.915 V		1.085 V	0.042 V
1 MHz	2 V	1.831 V		2.169 V	0.084 V
10 MHz	1 V	0.879 V		1.121 V	0.060 V
30 MHz	1 V	0.799 V		1.201 V	0.100 V
30 MHz	2 V	1.599 V		2.401 V	0.200 V

Change 4

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (1pF STANDARD (0 m)).

IMPEDANCE MEASUREMENT ACCURACY TEST

1 pF STANDARD (0 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
5 mV	C.V. - 0.04000 pF		C.V. + 0.04000 pF	0.0005 pF
	-0.0400		0.0400	0.0002
20 mV	C.V. - 0.01135 pF		C.V. + 0.01135 pF	0.0005 pF
	-0.0114		0.0114	0.0002
100 mV	C.V. - 0.00371 pF		C.V. + 0.00371 pF	0.0005 pF
	-0.0037		0.0037	0.0002
1 V	C.V. - 0.00275 pF		C.V. + 0.00275 pF	0.0005 pF
	-0.0028		0.0028	0.0002
2 V	C.V. - 0.00228 pF		C.V. + 0.00228 pF	0.0005 pF
	-0.0023		0.0023	0.0002

© Copyright 2012 Agilent Technologies

Change 5

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (10pF STANDARD (0 m)).

10 pF STANDARD (0 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
5 mV	C.V. - 0.0689 pF		C.V. + 0.0689 pF	0.0025 pF
	-0.0069		0.0069	0.0002
20 mV	C.V. - 0.0307 pF		C.V. + 0.0307 pF	0.0025 pF
	-0.0031		0.0031	0.0002
100 mV	C.V. - 0.0244 pF		C.V. + 0.0244 pF	0.0025 pF
	-0.0024		0.0024	0.0002
1 V	C.V. - 0.0244 pF		C.V. + 0.0244 pF	0.0025 pF
	-0.0024		0.0024	0.0002
2 V	C.V. - 0.0212 pF		C.V. + 0.0212 pF	0.0025 pF
	-0.0021		0.0021	0.0002

© Copyright 2012 Agilent Technologies

Change 6

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (100pF STANDARD (0 m)).

100 pF STANDARD (0 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
5 mV	C.V. - 0.636 pF		C.V. + 0.636 pF	0.0250 pF
	-0.0064		0.0064	0.0002
20 mV	C.V. - 0.222 pF		C.V. + 0.222 pF	0.0250 pF
	-0.0022		0.0022	0.0002
100 mV	C.V. - 0.153 pF		C.V. + 0.153 pF	0.0250 pF
	-0.0015		0.0015	0.0002
1 V	C.V. - 0.153 pF		C.V. + 0.153 pF	0.0250 pF
	-0.0015		0.0015	0.0002
2 V	C.V. - 0.218 pF		C.V. + 0.218 pF	0.0250 pF
	-0.0022		0.0022	0.0002

© Copyright 2012 Agilent Technologies

Change 7

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (1000pF STANDARD (0 m)).

1000 pF STANDARD (0 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
5 mV	C.V. - 3.59 pF		C.V. + 3.59 pF	0.5000 pF
	-0.0036		0.0036	0.0002
20 mV	C.V. - 1.52 pF		C.V. + 1.52 pF	0.5000 pF
	-0.0015		0.0015	0.0002
100 mV	C.V. - 1.52 pF		C.V. + 1.52 pF	0.5000 pF
	-0.0015		0.0015	0.0002
1 V	C.V. - 1.52 pF		C.V. + 1.52 pF	0.5000 pF
	-0.0015		0.0015	0.0002
2 V	C.V. - 1.88 pF		C.V. + 1.88 pF	0.5000 pF
	-0.0019		0.0019	0.0002

© Copyright 2012 Agilent Technologies

Change 8

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (20 cm AIR LINE (0 m)).

20 cm AIR LINE (0 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Frequency	Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1.1 MHz	1 V	C.V. - 0.0316 pF		C.V. + 0.0316 pF	0.0072 pF
		-0.0023		0.0023	0.0005
1.1 MHz	2 V	C.V. - 0.0282 pF		C.V. + 0.0282 pF	0.0072 pF
		-0.0021		0.0021	0.0005
2 MHz	1 V	C.V. - 0.0303 pF		C.V. + 0.0303 pF	0.0076 pF
		-0.0022		0.0022	0.0005
2 MHz	2 V	C.V. - 0.04505 pF		C.V. + 0.04505 pF	0.0076 pF
		-0.0033		0.0033	0.0005
5 MHz	1 V	C.V. - 0.0518 pF		C.V. + 0.0518 pF	0.0110 pF
		-0.0038		0.0038	0.0008
5 MHz	2 V	C.V. - 0.04685 pF		C.V. + 0.04685 pF	0.0110 pF
		-0.0035		0.0035	0.0008
10 MHz	20 mV	C.V. - 0.2182 pF		C.V. + 0.2182 pF	0.0230 pF
		-0.0161		0.0161	0.0016
10 MHz	100 mV	C.V. - 0.1121 pF		C.V. + 0.1121 pF	0.0230 pF
		-0.0083		0.0083	0.0016
10 MHz	1 V	C.V. - 0.1121 pF		C.V. + 0.1121 pF	0.0230 pF
		-0.083		0.0083	0.0016
10 MHz	2 V	C.V. - 0.0988 pF		C.V. + 0.0988 pF	0.0230 pF
		-0.0073		0.0073	0.0016
20 MHz	1 V	C.V. - 0.2392 pF		C.V. + 0.2392 pF	0.0690 pF
		-0.0177		0.0177	0.0049
20 MHz	2 V	C.V. - 0.2739 pF		C.V. + 0.2739 pF	0.0690 pF
		-0.0203		0.0203	0.0049
30 MHz	1 V	C.V. - 0.5201 pF		C.V. + 0.5201 pF	0.1500 pF
		-0.0385		0.0385	0.0105
30 MHz	2 V	C.V. - 0.4938 pF		C.V. + 0.4938 pF	0.1500 pF
		-0.0365		0.0365	0.0105

© Copyright 2012 Agilent Technologies

Change 9

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (100pF STANDARD (1 m)).

100 pF STANDARD (1 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1 V	C.V. - 0.220 pF		C.V. + 0.220 pF	0.0250 pF
	-0.0022		0.0022	0.0002
2 V	C.V. - 0.285 pF		C.V. + 0.285 pF	0.0250 pF
	-0.0029		0.0029	0.0002

Change 10

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (1000pF STANDARD (1 m)).

1000 pF STANDARD (1 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1 V	C.V. - 2.19 pF		C.V. + 2.19 pF	0.5000 pF
	-0.0022		0.0022	0.0002
2 V	C.V. - 2.55 pF		C.V. + 2.55 pF	0.5000 pF
	-0.0025		0.0025	0.0002

© Copyright 2012 Agilent Technologies

Change 11

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (20 cm AIR LINE (1 m)).

20 cm AIRLINE (1 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Frequency	Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
10 MHz	1 V	C.V. - 0.2022 pF		C.V. + 0.2022 pF	0.0230 pF
		-0.0150		0.0150	0.0016
10 MHz	2 V	C.V. - 0.1889 pF		C.V. + 0.1889 pF	0.0230 pF
		-0.0140		0.0140	0.0016
30 MHz	1 V	C.V. - 0.7903 pF		C.V. + 0.7903 pF	0.1500 pF
		-0.0585		0.0585	0.0105
30 MHz	2 V	C.V. - 0.7640 pF		C.V. + 0.7640 pF	0.1500 pF
		-0.0565		0.0565	0.0105

Change 12

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (100pF STANDARD (2 m)).

100 pF STANDARD (2 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1 V	C.V. - 0.220 pF		C.V. + 0.220 pF	0.0250 pF
	-0.0022		0.0022	0.0002
2 V	C.V. - 0.285 pF		C.V. + 0.285 pF	0.0250 pF
	-0.0029		0.0029	0.0002

© Copyright 2012 Agilent Technologies

Change 13

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (1000pF STANDARD (2 m)).

1000 pF STANDARD (2 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1 V	C.V. - 2.19 pF		C.V. + 2.19 pF	0.5000 pF
	-0.0022		0.0022	0.0002
2 V	C.V. - 2.55 pF		C.V. + 2.55 pF	0.5000 pF
	-0.0025		0.0025	0.0002

Change 14

Revised Minimum, Maximum & Measurement Uncertainty in Impedance Measurement Accuracy Test (20 cm AIR LINE (2 m)).

20 cm AIRLINE (2 m) C.V.: _____ (Cal.Value at 1MHz)

Test Frequency: 1MHz

Upper Value: Capacitance (Cp)

Lower Value: Dissipation Factor (D)

Test Frequency	Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
10 MHz	1 V	C.V. - 0.2022 pF		C.V. + 0.2022 pF	0.0230 pF
		-0.0150		0.0150	0.0016
10 MHz	2 V	C.V. - 0.1889 pF		C.V. + 0.1889 pF	0.0230 pF
		-0.0140		0.0140	0.0016
30 MHz	1 V	C.V. - 0.7903 pF		C.V. + 0.7903 pF	0.1500 pF
		-0.0585		0.0585	0.0105
30 MHz	2 V	C.V. - 0.7640 pF		C.V. + 0.7640 pF	0.1500 pF
		-0.0565		0.0565	0.0105

© Copyright 2012 Agilent Technologies

Change 15

Revised Minimum, Maximum & Measurement Uncertainty in DC BIAS LEVEL ACCURACY TEST (OPTION 001 ONLY).

Bias Voltage	Minimum	Measured Value	Maximum	Measurement Uncertainty
0.0 V	-0.0010 V		0.0010 V	0.001 mV
0.1 V	0.0989 V		0.1011 V	0.011 mV
2 V	1.9970 V		2.0030 V	0.022 mV
6 V	5.9920 V		6.0080 V	0.062 mV
14 V	13.981 V		14.019 V	0.198 mV
30 V	29.960 V		30.040 V	0.390 mV
40 V	39.950 V		40.050 V	0.510 mV
-0.1 V	-0.1011 V		-0.0989 V	0.011 mV
-2 V	-2.0030 V		-1.9970 V	0.022 mV
-6 V	-6.0080 V		-5.9920 V	0.062 mV
-14 V	-14.019 V		-13.981 V	0.198 mV
-30 V	-30.040 V		-29.960 V	0.390 mV
-40 V	-40.050 V		-39.950 V	0.510 mV

Change 16

Revised Minimum, Maximum & Measurement Uncertainty in VOLTAGE RATIO MONITOR ACCURACY TEST (OPTION 002 ONLY).

C.V.(Step Attenuator 20dB Cal. Value at 1 MHz): _____ [dB]

Minimum	Measured Value	Maximum	Measurement Uncertainty
C.V. - 0.087 dB		C.V. + 0.086 dB	0.022 dB

© Copyright 2012 Agilent Technologies

Agilent 4285A Precision LCR Meter Maintenance Manual

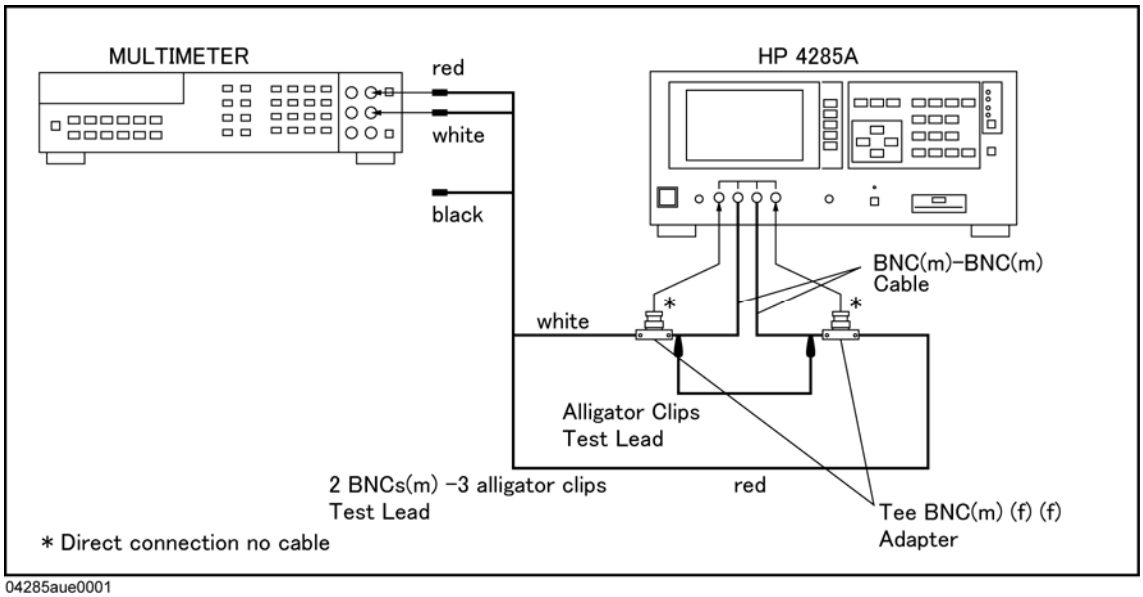
Manual Change

Agilent Part No. N/A

July 2007

Change 1

Change the figure 1-15 of DC Bias Level Accuracy Test Setup without the Interface Box (page 1-27) as follows.



04285aue0001

© Copyright 2007 Agilent Technologies

© Copyright 2012 Agilent Technologies

CHAPTER 1

PERFORMANCE TESTS

1-1. INTRODUCTION

This chapter provides the test procedures to verify that the HP 4285A meets the specifications listed in the HP 4285A Operation Manual. All tests can be performed without accessing the interior of the instrument. Performance tests are used to perform incoming inspection and to verify that the HP 4285A is within its performance specifications after troubleshooting or adjustment have been performed. If the performance tests indicate that the HP 4285A is not within specifications, check your test setup, then proceed to Adjustments or Troubleshooting as required.

NOTE

Allow the HP 4285A to warm up for a minimum of 30 minutes before starting any of the performance tests.

NOTE

The performance tests are valid only when performed in an ambient temperature of 23 °C ±5 °C.

1-2. TEST EQUIPMENT

Tables 1-1 and 1-2 list the test equipment required to perform the tests described in this chapter. Use only calibrated test instruments when performance testing the HP 4285A. If the recommended test equipment is not available, equipment with specifications equal to or surpassing those of the recommended equipment may be used.

NOTE

Components used as standards must be (1) calibrated using an instrument whose specifications are traceable to the National Institute of Standards and Technology (NIST) or an equivalent standards group, or (2) calibrated directly by an authorized calibration organization, such as NIST. The calibration cycle depends on the stability specification of each component.

NOTE

The HP 4285A Performance Test Program can be used for shortening the test time and to avoid human error. The HP Part Number for the program is as follows.

Description	HP Part Number
Test Program (5.25 inch floppy disk) Test Program (3.5 inch floppy disk)	04285-65001 04285-65002

Table 1-1. Recommended Test Equipment (1 of 2)

Equipment	Requirements	Recommended Model
Electronic Counter	Frequency: 75 kHz to 30 MHz Accuracy: <<0.01%	HP 5334B
RMS Voltmeter	Frequency: 75 kHz to 1 MHz Voltage range: 5 mVrms to 2 Vrms Accuracy: <<4%	HP 3458A
Power Meter	Frequency: 1 MHz to 30 MHz Accuracy: <<4%	HP 436A
Power Sensor	No substitute	HP 8482A
LCR Meter [1]	No substitute	HP 4284A
DC Voltmeter [2]	Voltage range: -40 V to 40 V Accuracy: <<0.1%	HP 3458A
Q measurement [3] Adapter	No substitute	HP 42851A
Computer	HP Technical Computer	HP 9000 Series 200 Model 226
Standard Capacitor	No substitute	HP 16380A
OPEN Termination	No substitute	HP 42090A
SHORT Termination	No substitute	HP 42091A
100 Ω Resistor [4]	No substitute	HP 42102A
20 cm Air Line [5]	No substitute	HP 11567A
0 Ω Termination [5]	No substitute	04191-85300
0 S Termination [5]	No substitute	04191-85302
Step Attenuator [3]	20 dB is calibrated at 1 MHz with uncertainty < 0.025 dB	HP 8495A (001, H04)
Fixed Attenuator [3]	Attenuation: 20 dB at 1 MHz	HP 8491A (020)

[1]: HP 4284A Serial Number 2940J01456 and above is required.
[2]: Required for Option 001
[3]: Required for Option 002
[4]: 100 Ω Resistor HPPN 04285-61001, HP 4285A furnished accessory can be used.
[5]: Included in the HP 16342A Calibration Equipment Kit

Table 1-2. Recommended Test Equipment (2 of 2)

Equipment	Requirements	Recommended Model
Terminal Adapter	No substitute	HP 16085B
1 m Test Leads	No substitute	HP 16048A
2 m Test Leads	No substitute	HP 16048D
Interface Box	No substitute	HP PN 04284-65007
Adapter	BNC(f)-BNC(f) BNC(f)-Dual Banana BNC(m)-N(f)	HP PN 1250-0080 HP PN 1251-2277 HP PN 1250-1477
Cable	BNC(m)-BNC(m), 30 cm BNC(m)-BNC(m), 61 cm	HP PN 8120-1838 HP PN 8120-1839
Power Splitter	No substitute	HP PN 04192-61001
HP-IB Cable	HP-IB cable, 1 m	HP 10833A
Memory Card	(HP 4285A furnished accessory)	HP PN 04278-89001
Bias IF Simulator [1]	No substitute	HP PN 42841-65001
Handler Simulator [2] [3]	No substitute	HP PN 04278-65001
Scanner Simulator [4]	No substitute	HP PN 04278-65301
Simulator Cable [3]	No substitute	HP PN 04278-61635
DC Power Source [1] [4]	+5 V, 0.1 A	HP 6214C

[1]: Required for Option 002
[2]: Required for Option 201
[3]: Required for Option 202
[4]: Required for Option 301

1-3. PERFORMANCE TEST RECORD

Record the results of each performance test in the Performance Test Record located at the end of this chapter. The performance record lists each test, parameters tested, acceptable tolerance limits, and measurement uncertainties for the recommended test equipment. Keep a record of past performance test results for comparison purposes to help indicate any possible areas of developing trouble.

1-4. INITIAL OPERATING PROCEDURE

Before starting the performance tests, the following procedure must be performed.

[Procedure]

1. Turn the HP 4285A ON.

NOTE

Steps 2 through 4 must be performed only when the HP 4285A is equipped with Option 002 Accessory Control Interface.

2. Press the **CATALOG SYSTEM** key and the **'SYSTEM CONFIG'** softkey to display the **SYSTEM CONFIG** page.
3. Move the cursor to the **CONFIG** field, using the **CURSOR** arrow keys.
4. Press the **'OFF'** softkey to disable the Accessory Control Interface.
5. Warm-up the HP 4285A for at least 30 minutes to allow its internal circuits to stabilize.

1-5. SYSTEM RESET

By using SYSTEM RESET function the HP 4285A can be set up easily for the performance tests. SYSTEM RESET can be performed using the following procedure.

[Procedure]

1. Press the **MEAS SETUP MENU** key to display the **MEAS SET UP** page.
2. Move the cursor to the **SYS MENU** field, using the **CURSOR** arrow keys.
3. Press the **'more 1/2'** softkey to display the **'SYSTEM RESET'** softkey.
4. Press the **'SYSTEM RESET'** softkey.
5. Press the **'YES'** softkey to perform a SYSTEM RESET.

1-6. TEST FREQUENCY ACCURACY TEST

This test verifies that the HP 4285A test frequency accuracy is within ±0.01%. The accuracy is specified for an ambient temperature range of 23 °C ±5 °C.

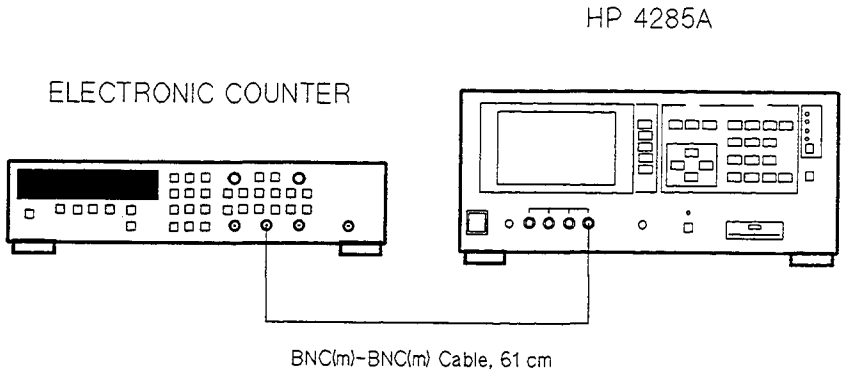


Figure 1-1. Test Frequency Accuracy Test Setup

EQUIPMENT:

Electronic Counter	HP 5334B
BNC(m)-to-BNC(m) Cable, 61 cm	HP PN 8120-1839

PROCEDURE:

1. Set up the equipment as shown in Figure 1-1.
2. Perform a SYSTEM RESET as described on page 1-4.
3. Move the cursor to the **FREQ** field.
4. Set the test frequency according to Table 1-3, and confirm that the counter readings are within the test limits given in the table.

Table 1-3. Test Frequency Test limits

Test Frequency	Test Limits
100 kHz	99.990 kHz to 100.010 kHz
149 kHz	148.985 kHz to 149.015 kHz
1 MHz	0.99990 MHz to 1.00010 MHz
10 MHz	9.9990 MHz to 10.0010 MHz
16 MHz	15.9984 MHz to 16.0016 MHz
17 MHz	16.9983 MHz to 17.0017 MHz
30 MHz	29.9970 MHz to 30.0030 MHz

1-7. TEST SIGNAL LEVEL MONITOR ACCURACY TEST

This test verifies that the HP 4285A test signal level monitor accuracy is within ±[(4+0.2×fm)% of reading + Vm × 0.002].
(fm:test frequency [MHz], Vm: test signal level setting) The accuracy is specified for an ambient temperature range of 23 °C ±5 °C. The test consists of a Low Frequency Test and a High Frequency Test.

1-7-1. LOW FREQUENCY TEST

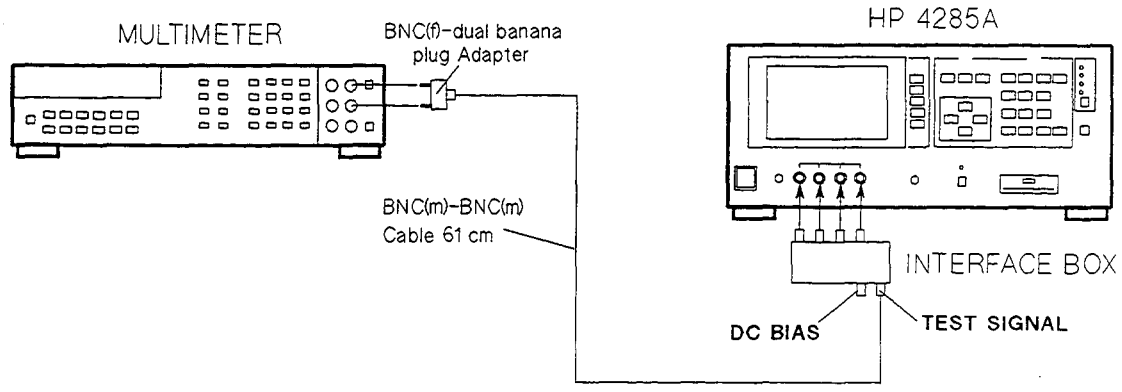


Figure 1-2. Test Signal Level Monitor Accuracy Test Setup using an Interface Box

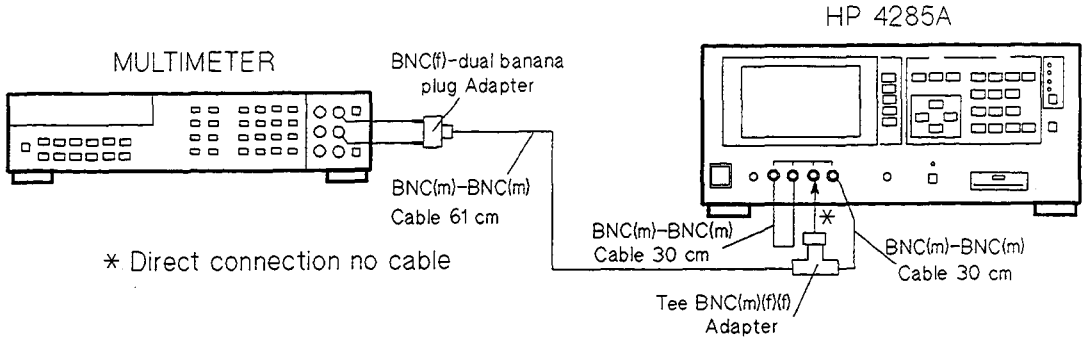


Figure 1-3. Test Signal Level Monitor Accuracy Test Setup without an Interface Box

NOTE

The length of the BNC to BNC cables used in this test should be ≤ 61 cm.

EQUIPMENT:

Interface Box	HP PN 04284-65007
Multimeter	HP 3458A
BNC(m)-BNC(m) Cable, 61 cm	HP PN 8120-1839
BNC(f) to dual banana plug Adapter	HP PN 1251-2277

PROCEDURE:

1. Set up the equipment as shown in Figure 1-2.

NOTE

If the Interface Box is not available, use the following cables and adapters as a substitute. Figure 1-3 shows the test setup without the interface box.

BNC(m)-BNC(m) Cable, 30 cm	HP PN 8120-1838 2 ea.
Tee, BNC(m)(f)(f) Adapter	HP PN 1250-0781

2. Set the multimeter as follows.

   - **ACV**
   - **Auto**
   - **SETACV SYNC**
   - **NPLC = 100**

3. Perform a SYSTEM RESET as described on page 1-4.

4. Press the **MEAS SETUP MENU** key and the **'CORRECTION'** softkey to display the **CORRECTION** page.

5. Move the cursor to the **CABLE** field, and press the **'0 m'** softkey to set the cable length to 0 m.

6. Press the **DISPLAY FORMAT MENU** key to display the **MEAS DISPLAY** page.

7. Move the cursor to the **FREQ** field and set the test frequency to 100 kHz.

8. Record the multimeter reading into Calculation Sheet column **[a]**, and calculate the test limits according to the calculation sheet.

9. Confirm that the Level Monitor reading **(Vm)** is within the specified test limits.

10. Perform the test for all settings listed in Table 1-4 by repeating steps 7 to 9 for each listed setting.

Table 1-4. Test Signal Level Monitor Accuracy Test Limit

Test Frequency	Test Signal Level	Test Limit
100 kHz	1 V	M.R. ± 0.042×M.R.
1 MHz	20 mV	M.R. ± 0.044×M.R.
1 MHz	100 mV	M.R. ± 0.044×M.R.
1 MHz	1 V	M.R. ± 0.044×M.R.
1 MHz	2 V	M.R. ± 0.044×M.R.

M.R.: Multimeter Reading

1-7-2. HIGH FREQUENCY TEST

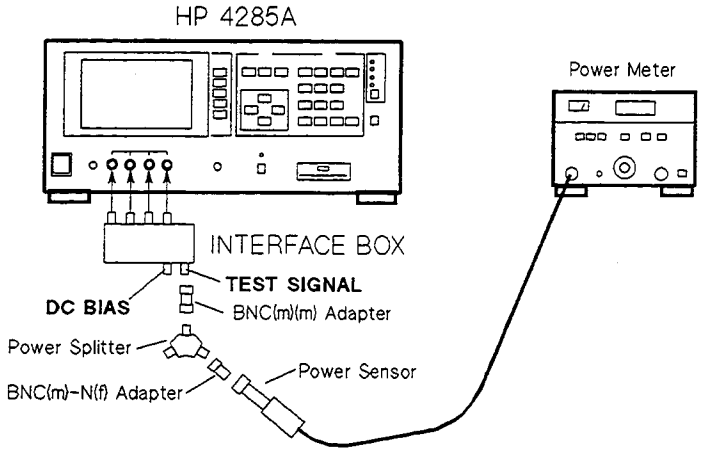


Figure 1-4. Test Signal Level Monitor Accuracy Test Setup using an Interface Box

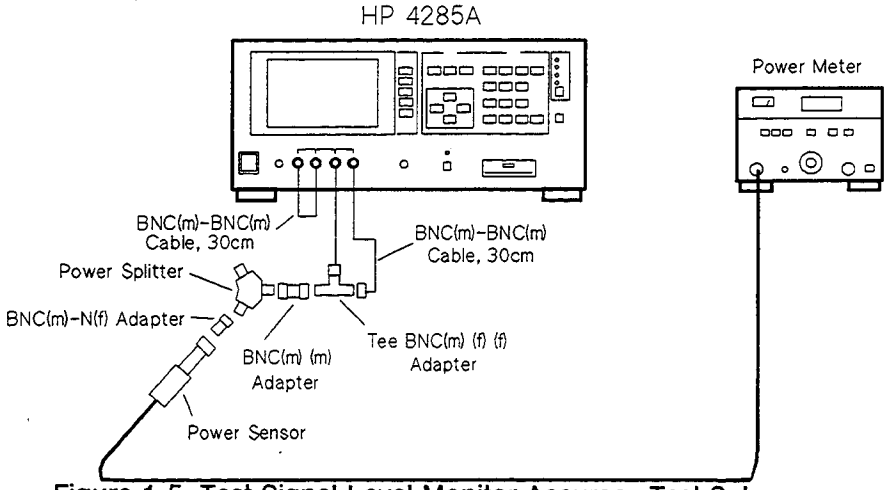


Figure 1-5. Test Signal Level Monitor Accuracy Test Setup without an Interface Box

NOTE

The length o the BNC to BNC cables used in this test should be ≤ 30 cm.

EQUIPMENT:

Interface Box	HP PN 04284-65007
Power Meter	HP 436A
Power Sensor	HP 8482A
Power Splitter	HP PN 04192-61001
BNC(m)-BNC(m) Adapter	HP PN 1250-0216
BNC(m)-N(f) Adapter	HP PN 1250-1477
BNC(m)-BNC(m) Cable, 30 cm	HP PN 8120-1838

PROCEDURE:

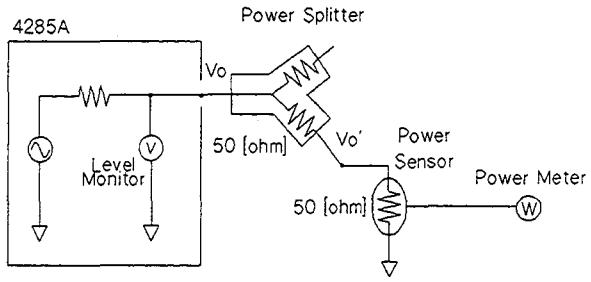
1. Calibrate the Power Meter for the Power Sensor.
2. Set up the equipment as shown in Figure 1-4.

NOTE

If the Interface Box is not available, use the following cables and adapters as a substitute. Figure 1-5 shows the test setup without the interface box.

BNC(m)-BNC(m) Cable, 30 cm	HP PN 8120-1838 2 ea.
Tee, BNC(m)(f)(f) Adapter	HP PN 1250-0781

3. Set the Power Meter to **WATT**.
4. Perform a SYSTEM RESET as described on page 1-4.
5. Move the cursor to the **FREQ** field and set the test frequency to 3 MHz.
6. Set the Power Meter CAL FACTOR % dial setting to the Power Sensor's CAL FACTOR.
7. Record the Power Meter reading into Calculation Sheet column **[a]**.
8. Calculate the test signal voltage according to the Calculation Sheet, and record it into column **[b]**. Figure 1-6 explains the voltage calculation theory.



$$P\,[W] = \frac{(\,Vo'\,[V]\,)^2}{50\,[ohm]} \quad \therefore \quad Vo'\,[V] = \sqrt{50\,[ohm] \times P\,[W]}$$

$$Vo\,[V] = \frac{50 + 50\,[ohm]}{50\,[ohm]} \times Vo' = 2 \times \sqrt{50\,[ohm] \times P\,[W]}$$

P: Power Meter Reading

Figure 1-6. Test Signal Voltage Calculation

9. Calculate the test limit according to the Calculation Sheet.
10. Confirm that the Level Monitor reading **(Vm)** is within the specified test limits.
11. Perform the test for all settings listed in Table 1-5 by repeating steps 5 to 10 for each listed setting.

Table 1-5. Test Signal Level Monitor Accuracy Test Limit

Test Frequency	Test Signal Level	Test Limit
3 MHz	1 V	M.V. ± 0.048×M.V.
10 MHz	1 V	M.V. ± 0.062×M.V.
30 MHz	1 V	M.V. ± 0.102×M.V.

M.V.: Measured Voltage

1-8. TEST SIGNAL LEVEL ACCURACY TEST

This test verifies that the HP 4285A test signal level accuracy is within ±[(8+0.4×fm)% of reading + 1 mV]. (fm:test frequency [MHz]) The accuracy is specified for an ambient temperature range of 23 °C ±5 °C.

NOTE

The Test Signal Level Monitor Accuracy Test, described in paragraph 1-7, must be successfully completed before performing this test, because the test signal level accuracy is measured by the Test Signal Level Monitor.

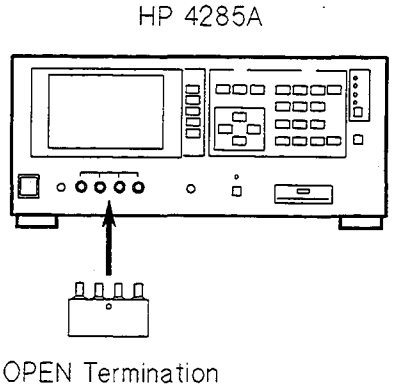


Figure 1-7. Test Signal Level Accuracy Test Setup

EQUIPMENT:

OPEN Termination	HP 42090A

PROCEDURE:

1. Perform a SYSTEM RESET as described on page 1-4.
2. Press the **MEAS SETUP MENU** key and the **'CORRECTION'** softkey to display the **CORRECTION** page.
3. Move the cursor to the **CABLE** field, and press the **'0 m'** softkey to set the cable length to 0 m.
4. Press the **DISPLAY FORMAT MENU** key to display the **MEAS DISPLAY** page.
5. Connect the OPEN Termination to the HP 4285A's **UNKNOWN** terminals.
6. Move the cursor to the **FREQ** field and set the test frequency to 100 kHz.

7. Confirm that the Level Monitor reading **(Vm)** is within the specified test limits listed in Table 1-6.

8. Set the test frequency and the test signal level according to Table 1-6, and confirm that the Level Monitor readings are within the specified test limits listed in Table 1-6.

Table 1-6. Test Signal Level Accuracy Test Limits

Test Frequency	Test Signal Level	Test Limit
100 kHz	1 V	0.919 V to 1.081 V
1 MHz	5 mV	3.580 mV to 6.52 mV
1 MHz	20 mV	17.32 mV to 22.68 mV
1 MHz	100 mV	90.6 mV to 109.4 mV
1 MHz	1 V	0.915 V to 1.085 V
1 MHz	2 V	1.831 V to 2.169 V
10 MHz	1 V	0.88 V to 1.12 V
30 MHz	1 V	0.80 V to 1.20 V

1-9. IMPEDANCE MEASUREMENT ACCURACY TEST

This test verifies the HP 4285A Impedance Measurement accuracy.

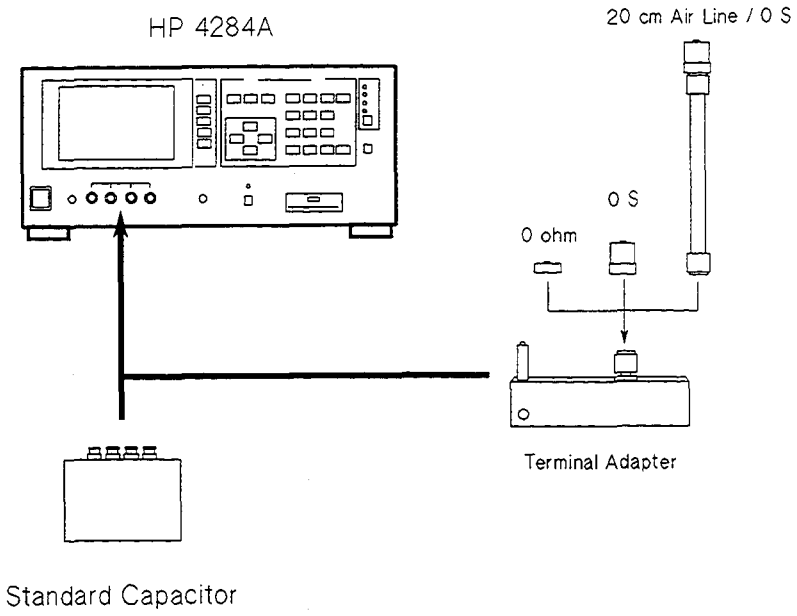


Figure 1-8. Air Line Calibration Setup

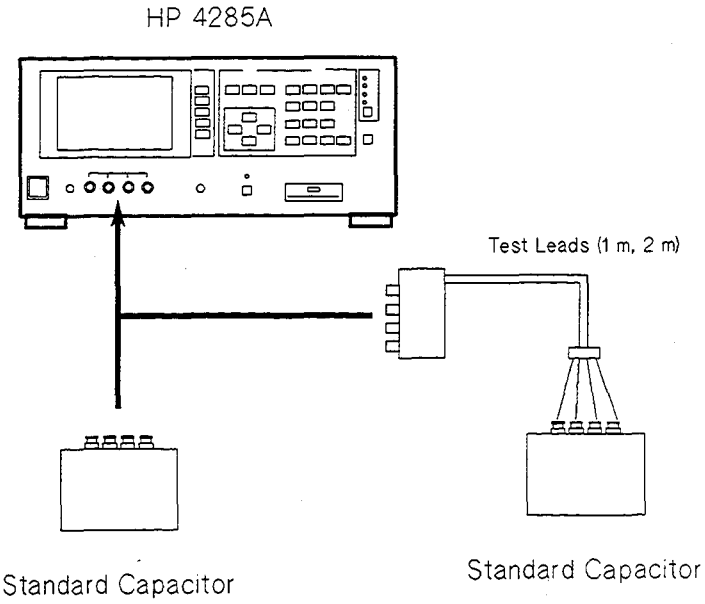


Figure 1-9. Impedance Measurement Accuracy Test Setup
(Low Frequency Test)

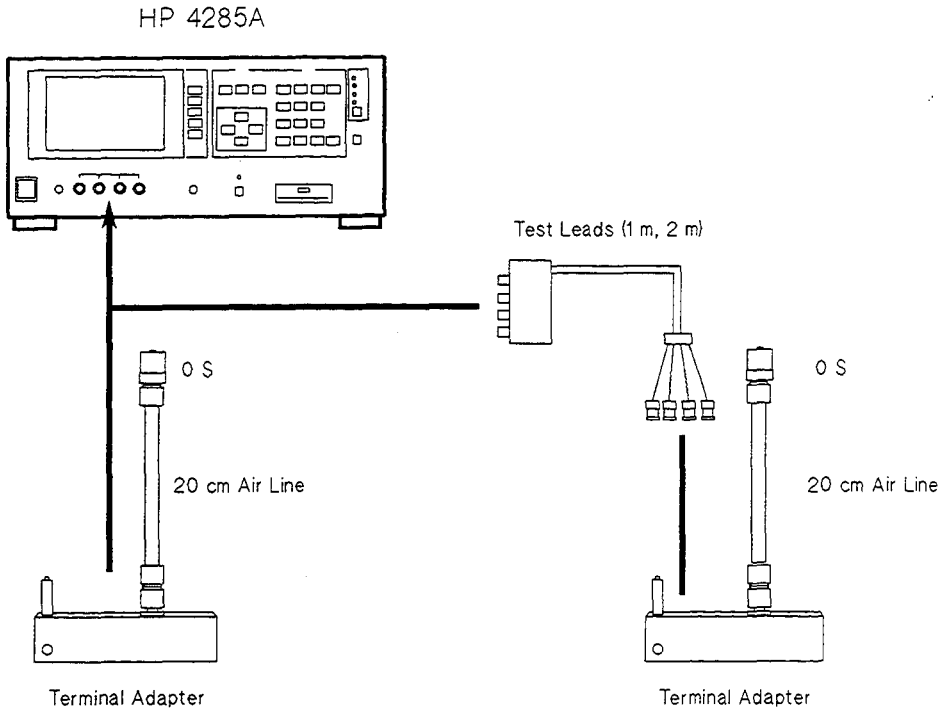


Figure 1-10. Impedance Measurement Accuracy Test Setup
(High Frequency Test)

EQUIPMENT:

LCR Meter [1]	HP 4284A
1 pF Standard Capacitor	HP 16381A
10 pF Standard Capacitor	HP 16382A
100 pF Standard Capacitor	HP 16383A HP 16380A
1000 pF Standard Capacitor	HP 16384A
OPEN Termination	HP 42090A
SHORT Termination	HP 42091A
100 Ω Resistor [2]	HP 42102A
20 cm Air Line [3]	HP 11567A
Terminal Adapter	HP 16085B
0 Ω Termination [3]	HP PN 04191-85300
0 S Termination [3]	HP PN 04191-85302
Adapter BNC(f) to BNC(f)	HP PN 1250-0080 4 ea.
Test Leads (1 m)	HP 16048A
Test Leads (2 m)	HP 16048D

[1]: HP 4284A Serial Numbered 2940J01456 and above is required.
[2]: 100 Ω Resistor HP PN 04285-61001, HP 4285A furnished accessory, can be used as a substitute.
[3]: Included in the HP 16342A Calibration Equipment Kit

PROCEDURE:

NOTE

The Impedance Measurement Accuracy Test consists of the following seven blocks.

Air Line Calibration	Steps 1 to 27
0 m Low Frequency Test	Steps 28 to 45
0 m High Frequency Test	Steps 46 to 61
1 m Low Frequency Test	Steps 62 to 76
1 m High Frequency Test	Steps 77 to 86
2 m Low Frequency Test	Steps 87 to 101
2 m High Frequency Test	Steps 102 to 111

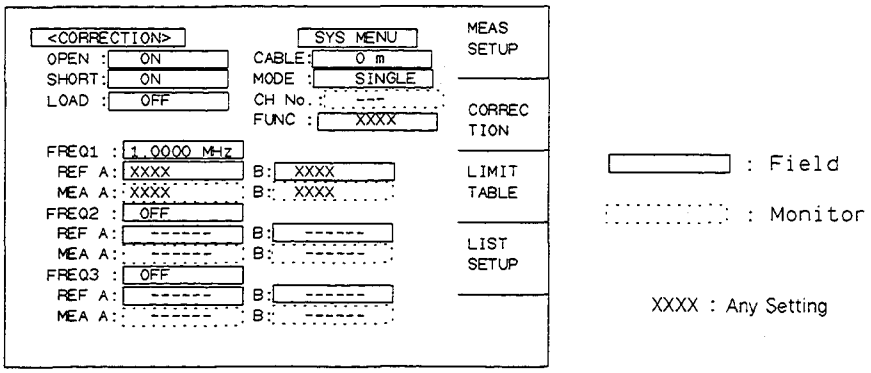
Air Line Calibration

1. Record the 10 pF Standard Capacitor's calibration value at 1 MHz into Calculation Sheet column **[a]**.

2. Initialize the HP 4284A by performing a SYSTEM RESET. The HP 4285A SYSTEM RESET procedure shown on page 1-4 also applies to the HP 4284A.

3. Press the **MEAS SETUP MENU** key and the **'CORRECTION'** softkey to display the **CORRECTION** page.

4. Set the **CORRECTION** page as shown in Figure 1-11.



FREQ 1: 1.0000 MHz
FREQ 2,3: OFF

Figure 1-11. Correction Page Setup

5. Connect the OPEN Termination to the HP 4284A's **UNKNOWN** terminals.

6. Move the cursor to the **FREQ1** field, and press the **'MEAS OPEN'** softkey to store the open correction data.

7. Connect the SHORT Termination to the HP 4284A's **UNKNOWN** terminals.

8. Press the **'MEAS SHORT'** softkey to store the short correction data.

9. Press the **MEAS SETUP MENU** key to display the **MEAS SETUP** page.

10. Move the cursor to the **FREQ** field, and set the test frequency to 1.00000 MHz.

11. Move the cursor to the **TRIG** field, and press the **'MAN'** softkey to set the trigger mode to manual.

12. Move the cursor to the **AVG** field, and press the **4** and **ENTER** keys to set the averaging rate to 4.

13. Press the **DISPLAY FORMAT MENU** key to display the **MEAS DISPLAY** page.

14. Connect the 10 pF Standard to the HP 4284A's **UNKNOWN** terminals.

15. Press the **TRIGGER** key.

16. Record the **Cp** reading into Calculation Sheet column **[b]**.

17. Connect the Terminal Adapter (HP 16085B) to the HP 4284A's **UNKNOWN** terminals.

18. Press the **MEAS SETUP MENU** key and the **'CORRECTION'** softkey to display the **CORRECTION** page.

19. Connect the 0 S Termination to the Terminal Adapter's **OUTPUT** terminal.

20. Move the cursor to the **FREQ1** field, and press the **'MEAS OPEN'** softkey to store the OPEN correction data.

21. Connect the 0 Ω Termination to the Terminal Adapter's **OUTPUT** terminals.

22. Press the **'MEAS SHORT'** softkey to store the short correction data.

23. Press the **DISPLAY FORMAT MENU** key to display the **MEAS DISPLAY** page.

24. Connect the 20 cm Air Line to the Terminal Adapter's **OUTPUT** terminal.

25. Connect the 0 S Termination to the 20 cm Air Line.

26. Press the **TRIGGER** key, and record the **Cp** reading into Calculation Sheet column **[c]**.

27. Calculate the Air Line calibration value for 1 MHz, according to the Calculation Sheet.

0 m Low Frequency Test

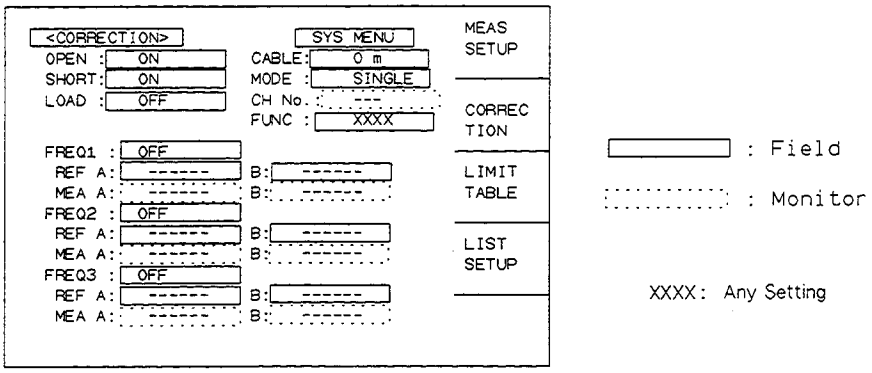
28. Initialize the HP 4285A by performing a SYSTEM RESET as described on page 1-4.

29. Move the cursor to the **INTEG** field, and press the **'LONG'** softkey to set the integration time to long.

30. Move the cursor to the **LEVEL** field, and set the test signal level to 0.5 V.

31. Press the **MEAS SETUP MENU** key and the **'CORRECTION'** softkey to display the **CORRECTION** page.

32. Set the **CORRECTION** page as shown in Figure 1-12.



FREQ 1 to 7: OFF

Figure 1-12. Correction Page Setup

33. Connect the OPEN Termination to the HP 4285A's **UNKNOWN** terminals.

34. Move the cursor to the **OPEN** field.

35. Press the **'MEAS OPEN'** softkey to store the open correction data.

NOTE

It takes approximately 40 s each to store the OPEN CORRECTION data and the SHORT CORRECTION data.

36. Connect the SHORT Termination to the HP 4285A's **UNKNOWN** terminals.

37. Move the cursor to the **SHORT** field.

38. Press the **'MEAS SHORT'** softkey to store the short correction data.

39. Press the **'MEAS SETUP MENU'** key to display the **MEAS SETUP** page.

40. Move the cursor to **TRIG** field, and press the **'MAN'** softkey to set the trigger mode to MANUAL.

41. Press the **'DISPLAY FORMAT MENU'** key to display the **MEAS DISPLAY** page.

42. Connect the 1 pF Standard to the HP 4285A's **UNKNOWN** terminals.

43. Move the cursor to the **LEVEL** field, and set the test signal level to 5 mV.

44. Press the **TRIGGER** key, and confirm that the HP 4285A's reading is within the specified test limits listed in table 1-7.

45. Perform the test for all standards and settings listed in Table 1-7, by repeating steps 42 to 44 for each listed setting and standard.

Table 1-7. Impedance Measurement Accuracy Test Limits
(0 m Low Frequency Test)

Signal Level		Test Limits (Cp, D)			
		1 pF	10 pF	100 pF	1000 pF
5 mV	Cp	C.V.±0.0399 pF	C.V.±0.068 pF	C.V.±0.63 pF	C.V.±3.5 pF
	D	±0.0399	±0.0068	±0.0063	±0.0035
20 mV	Cp	C.V.±0.0113 pF	C.V.±0.030 pF	C.V.±0.22 pF	C.V.±1.5 pF
	D	±0.0113	±0.0030	±0.0022	±0.0015
100 mV	Cp	C.V.±0.0037 pF	C.V.±0.024 pF	C.V.±0.15 pF	C.V.±1.5 pF
	D	±0.0037	±0.0024	±0.0015	±0.0015
1 V	Cp	C.V.±0.0027 pF	C.V.±0.024 pF	C.V.±0.15 pF	C.V.±1.5 pF
	D	±0.0027	±0.0024	±0.0015	±0.0015
2 V	Cp	C.V.±0.0022 pF	C.V.±0.021 pF	C.V.±0.21 pF	C.V.±1.8 pF
	D	±0.0022	±0.0021	±0.0021	±0.0018

Test Frequency: 1 MHz
C.V.: Calibration Value at 1 MHz

0 m High Frequency Test

46. Connect the Terminal Adapter (HP 16085B) to the HP 4285A's **UNKNOWN** terminals

47. Move the cursor to the **LEVEL** field, and set the test signal level to 0.5 V.

48. Press the **MEAS SETUP MENU** key and the **'CORRECTION'** softkey to display the **CORRECTION** page.

49. Connect the 0 S Termination (04191-85032) to the Terminal Adapter's **OUTPUT** terminal.

50. Move the cursor to the **OPEN** field.

51. Press the **'MEAS OPEN'** softkey to store the open correction data.

52. Connect the 0 Ω Termination (04191-85030) to the Terminal Adapter's **OUTPUT** terminal.

53. Move the cursor to the **SHORT** field.

54. Press the **'MEAS SHORT'** softkey to store the short correction data.

55. Press the **'DISPLAY FORMAT MENU'** key to display the **MEAS DISPLAY** page.

56. Connect the 20 cm Air Line to the Terminal Adapter's **OUTPUT** terminal.

57. Connect the 0 S Termination to the 20 cm Air Line.

58. Move the cursor to **LEVEL** field, and set the test signal level to 1 V.

59. Move the cursor to **FREQ** field, and set the test frequency to 1.1 MHz.

60. Press the **TRIGGER** key, and confirm that the HP 4285A's reading is within the specified test limits listed in Table 1-8.

61. Perform the test for all settings listed in Table 1-8, by repeating steps 58 to step 60 for each listed setting.

Table 1-8. Impedance Measurement Accuracy Test Limits
(0 m High Frequency Test)

Test Frequency	Test Signal Level	Test Limits	
		Cp	D
1.1 MHz	1 V	C.V.±0.032 pF	±0.0023
1.1 MHz	2 V	C.V.±0.028 pF	±0.0020
2 MHz	1 V	C.V.±0.030 pF	±0.0022
2 MHz	2 V	C.V.±0.044 pF	±0.0032
5 MHz	1 V	C.V.±0.051 pF	±0.0037
5 MHz	2 V	C.V.±0.047 pF	±0.0034
10 MHz	20 mV	C.V.±0.221 pF	±0.0158
10 MHz	100 mV	C.V.±0.114 pF	±0.0082
10 MHz	1 V	C.V.±0.114 pF	±0.0082
10 MHz	2 V	C.V.±0.100 pF	±0.0072
20 MHz	1 V	C.V.±0.246 pF	±0.0176
20 MHz	2 V	C.V.±0.281 pF	±0.0201
30 MHz	1 V	C.V.±0.536 pF	±0.0383
30 MHz	2 V	C.V.±0.509 pF	±0.0364

C.V.:Calibrated Value at 1 MHz, using an HP 4284A

1 m Low Frequency Test

62. Move the cursor to the LEVEL field, and set the test signal level to 0.5 V.

63. Press the **CATALOG SYSTEM MENU** key and **'CABLE CORREC'** softkey to display the **CABLE CORRECTION** page.

64. Move the cursor to **CABLE CORRECTION MENU** field.

65. Press the **1** and **ENTER** keys to start the 1 m Cable Correction.

66. Perform the 1 m Cable Correction according to the instruction on the HP 4285A's LCD.

67. Press the **MEAS SETUP MENU** key and the **'CORRECTION'** softkey to display the **CORRECTION** page.

68. Move the cursor to **CABLE** field, and press the **'1 m'** softkey to set the cable length to 1 m.

69. Connect the 1 m Test Leads (HP 16048A) to the **UNKNOWN** terminals.

70. Store the OPEN CORRECTION data and the SHORT CORRECTION data, refer to steps 33 to 38. In this procedure the OPEN termination and the SHORT termination should be connected to the 1 m Test Leads (HP 16048A) with 4 BNC(f)-BNC(f) adapters.

71. Press the **'DISPLAY FORMAT MENU'** key to display the **MEAS DISPLAY** page.

72. Connect the 100 pF Standard to the 1 m Test Leads.

73. Move the cursor to the **LEVEL** field, and set the test signal level to 1 V.

74. Move the cursor to the **FREQ** field, and set the test frequency to 1 MHz.

75. Press the **TRIGGER** key, and confirm that the HP 4285A's reading is within the specified test limits listed in Table 1-9.

76. Perform the test for all standards and settings listed in Table 1-9, by repeating steps 72 to 75 for each listed setting.

Table 1-9. Impedance Measurement Accuracy Test Limits
(1 m Low Frequency Test)

Signal Level		Test Limits (Cp,D)	
		100 pF	1000 pF
1 V	Cp	C.V.±0.22 pF	C.V.±2.1 pF
	D	±0.0022	±0.0021
2 V	Cp	C.V.±0.28 pF	C.V.±2.5 pF
	D	±0.0028	±0.0025

Test Frequency: 1 MHz
C.V.: Calibration Value at 1 MHz

1 m High Frequency Test

77. Connect the Terminal Adapter to the HP 4285A's **UNKNOWN** terminal with the 1 m Test Leads.

78. Move the cursor to the **LEVEL** field, and set the test signal level to 0.5 V.

79. Store the OPEN CORRECTION data and the SHORT CORRECTION data, refer to steps 48 to 54.

80. Press the **'DISPLAY FORMAT MENU'** key to display the **MEAS DISPLAY** page.

81. Connect the 20 cm Air Line to the Terminal Adapter's **OUTPUT** terminal.

82. Connect the 0 S Termination to the 20 cm Air Line.

83. Move the cursor to the **LEVEL** field, and set the test signal level to 1 V.

84. Move the cursor to the **FREQ** field, and set the test frequency to 10 MHz.

85. Press the **TRIGGER** key, and confirm that the HP 4285A's reading is within the specified test limits listed in Table 1-10.

86. Perform the test for all settings listed in Table 1-10, by repeating steps 83 to step 85 for each listed setting.

Table 1-10. Impedance Measurement Accuracy Test Limits
(1 m High Frequency Test)

Test Frequency	Test Signal Level	Test Limits	
		Cp	D
10 MHz	1 V	C.V.±0.208 pF	±0.0149
10 MHz	2 V	C.V.±0.194 pF	±0.0139
30 MHz	1 V	C.V.±0.816 pF	±0.0583
30 MHz	2 V	C.V.±0.789 pF	±0.0564

C.V.:Calibrated Value at 1 MHz, using an HP 4284A

2 m Low Frequency Test

87. Move the cursor to the **LEVEL** field, and set the test signal level to 0.5 V.

88. Press the **CATALOG SYSTEM MENU** key and **'CABLE CORREC'** softkey to display the **CABLE CORRECTION** page.

89. Move the cursor to the **CABLE CORRECTION MENU** field.

90. Press the **2** and **ENTER** keys to start the 2 m Cable Correction.

91. Perform the 2 m Cable Correction according to the instructions displayed on the HP 4285A's LCD.

92. Press the **MEAS SETUP MENU** key and the **'CORRECTION'** softkey to display the **CORRECTION** page.

93. Move the cursor to the **CABLE** field, and press the **'2 m'** softkey to set the cable length to 2 m.

94. Connect the 2 m Test Leads (HP 16048D) to the **UNKNOWN** terminals.

95. Store the OPEN CORRECTION data and the SHORT CORRECTION data, refer to steps 33 to 38. In this procedure the OPEN termination and the SHORT termination must be connected to the 2 m Test Leads (HP 16048D) with 4 BNC(f)-BNC(f) adapters.

96. Press the **'DISPLAY FORMAT MENU'** key to display the **MEAS DISPLAY** page.

97. Connect the 100 pF Standard to the 2 m Test Leads.

98. Move the cursor to the **LEVEL** field, and set the test signal level to 1 V.

99. Move the cursor to the **FREQ** field, and set the test frequency to 1 MHz.

100. Press the **TRIGGER** key, and confirm that the HP 4285A's reading is within the specified test limits listed in Table 1-11.

101. Perform the test for all standards and settings listed in Table 1-11, by repeating steps 97 to 100 for each listed setting and standard.

Table 1-11. Impedance Measurement Accuracy Test Limits
(2 m Low Frequency Test)

Signal Level		Test Limits (Cp,D)	
		100 pF	1000 pF
1 V	Cp	C.V.±0.22 pF	C.V.±2.1 pF
	D	±0.0022	±0.0021
2 V	Cp	C.V.±0.28 pF	C.V.±2.5 pF
	D	±0.0028	±0.0025

Test Frequency: 1 MHz
C.V.: Calibration Value at 1 MHz

2 m High Frequency Test

102. Move the cursor to the **LEVEL** field, and set the test signal level to 0.5 V.

103. Connect the Terminal Adapter to the HP 4285A's **UNKNOWN** terminals using the 2 m Test Leads.

104. Store the OPEN CORRECTION data and the SHORT CORRECTION data, refer to steps 48 to 54.

105. Press the **'DISPLAY FORMAT MENU'** key to display the **MEAS DISPLAY** page.

106. Connect the 20 cm Air Line to the Terminal Adapter's **OUTPUT** terminal.

107. Connect the 0 S Termination to the 20 cm Air Line.

108. Move the cursor to the **LEVEL** field, and set the test signal level to 1 V.

109. Move the cursor to the **FREQ** field, and set the test frequency to 10 MHz.

110. Press the **TRIGGER** key, and confirm that the HP 4285A's reading is within the specified test limits listed in Table 1-12.

111. Perform the test for all settings listed in Table 1-12, by repeating steps 108 to 110 for each listed setting.

Table 1-12. Impedance Measurement Accuracy Test Limits
(2 m High Frequency Test)

Test Frequency	Test Signal Level	Test Limits	
		Cp	D
10 MHz	1 V	C.V.±0.208 pF	±0.0149
10 MHz	2 V	C.V.±0.194 pF	±0.0139
30 MHz	1 V	C.V.±0.816 pF	±0.0583
30 MHz	2 V	C.V.±0.789 pF	±0.0564

C.V.:Calibrated Value at 1 MHz, using an HP 4284A

1-10. STORE AND LOAD FUNCTION TEST

This test verifies the HP 4285A's ability to store information to, and load information from a memory card.

EQUIPMENT:

Memory Card	HP PN 04278-89001

PROCEDURE:

1. Perform a SYSTEM RESET as described on page 1-4.
2. Insert a memory card into the **MEMORY** card slot.
3. Display the **MEAS SETUP** page.

NOTE

This test should be performed from the **MEAS SETUP** page.

4. Change the measurement function from **Cp-D** to **Cp-G**, in the **FUNC** field.
5. Use the **CURSOR** arrow keys to move the cursor to the **SYS MENU** field.
5. Press the **'STORE'** softkey to store the HP 4285A's control settings to the memory card as data record-number 10.
6. Press the **'CLEAR SETUP'** softkey to clear the set up, and then confirm that **FUNC** is set to **Cp-D**.
7. Press the **'LOAD'** softkey to load data record-number 10 from the memory card.
8. Confirm that the measurement function is set to **Cp-G**.

1-11. HP-IB INTERFACE TEST

This test verifies the HP 4285A'S HP-IB function.

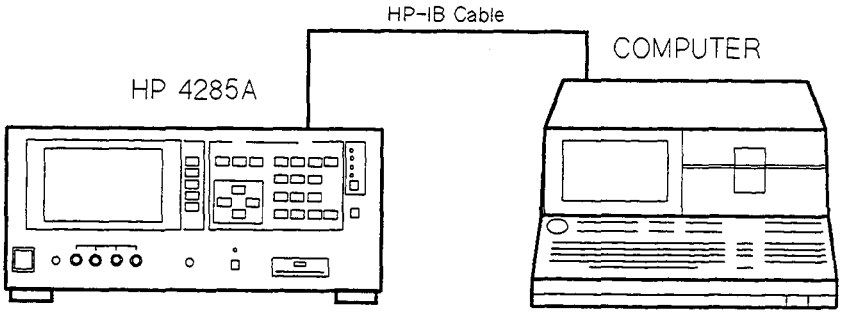


Figure 1-13. HP-IB Interface Test Setup

EQUIPMENT:

Personal Technical Computer	HP 9000 Series 200 Model 226
HP-IB Cable	HP 10833A

PROCEDURE:

1. Set the HP 4285A's HP-IB address to 17.

2. Set up the equipment as shown in Figure 1-13. Set the computer's interface Select Code to (7).

3. Load BASIC and input the following program, but do not **RUN** the program yet.

```
10  DIM A$[38]
20  OUTPUT 717;"*IDN?"
30  ENTER 717;A$
40  PRINT A$
50  OUTPUT 717;"*CLS;*ESE 32;*SRE32"
60  OUTPUT 717;"ABC"
70  PRINT SPOLL(717)
80  END
```

4. Press the computer's **STEP** key three times to single step to line 20.

5. Confirm that the **LTN** and **RMT** lamps are ON and that the softkey label page cannot be changed by pressing the **MENU** keys.

6. Press the HP 4285A **LCL** key.

7. Confirm that the **LTN** lamp stays ON, the **RMT** lamp is OFF, and the softkey label page can be changed by pressing the **MENU** keys.

8. Press the computer's **STEP** key to execute line 30 and confirm that the **TLK** lamp is ON.

9. Step to line 40 and confirm that the following message is displayed on the computer.

"HEWLETT-PACKARD,4285A,0,REV01.00"

10. Step to line 60, and confirm that the **SRQ**, **LTN**, and **RMT** lamps are ON.

11. Step to line 80 and confirm that the status byte value displayed on the computer is greater than 95.

1-12. DC BIAS LEVEL ACCURACY TEST (OPTION 001 ONLY)

This test verifies that the HP 4285A Internal DC Bias Level accuracy meets the following specifications. The accuracy is specified for an ambient temperature range of 23 °C ± 5 °C.

Voltage Range	Setting Accuracy
±(0.000 to 4.000) V	±(0.1% of setting+1 mV)
±(4.002 to 8.000) V	±(0.1% of setting+2 mV)
±(8.005 to 20.000) V	±(0.1% of setting+5 mV)
±(20.01 to 40.00) V	±(0.1% of setting+10 mV)

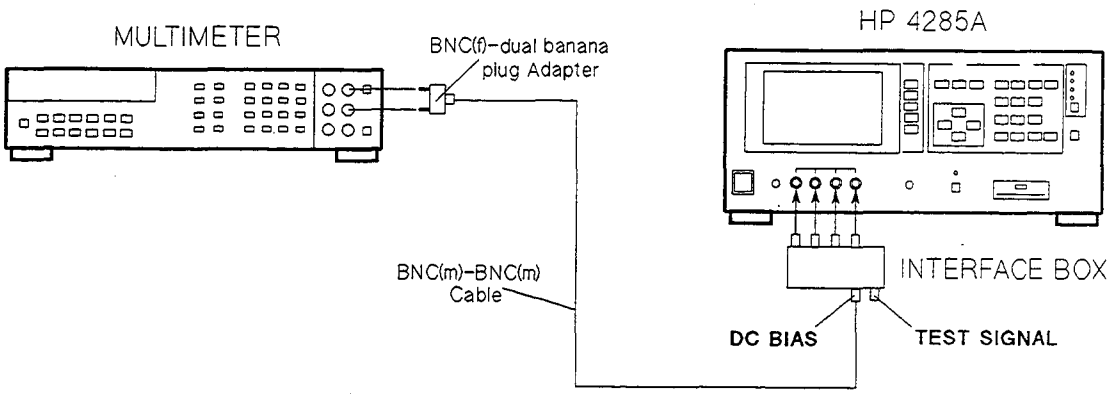


Figure 1-14. DC Bias Level Accuracy Test Setup Using an Interface Box

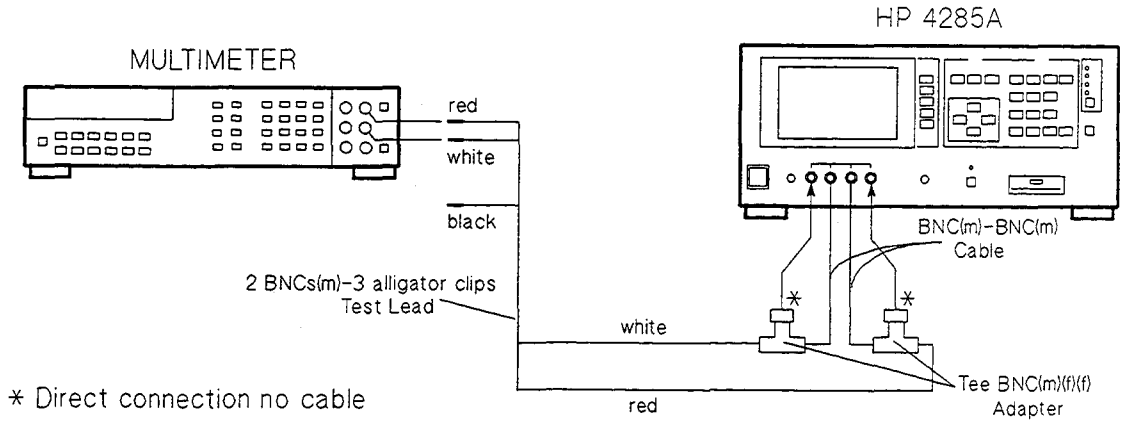


Figure 1-15. DC Bias Level Accuracy Test Setup Without an Interface Box

EQUIPMENT:

Interface Box	HP PN 04284-65007
Multimeter	HP 3458A
BNC(m)-to-BNC(m) Cable, 61 cm	HP PN 8120-1839
BNC(f) to dual banana plug Adapter	HP PN 1251-2277

PROCEDURE:

1. Connect the equipment as shown in Figure 1-14.

NOTE

If the Interface Box is not available, use the following cables and adapters as a substitute. Figure 1-15 shows the test setup without the interface box. The center conductors of HCUR and HPOT are connected to the Hi-input of the multimeter. The center conductors of the LCUR and LPOT are connected to Lo-input of the multimeter.

BNC(m)-BNC(m) Cable, 30 cm	HP PN 8120-1838 2 ea.
Test Lead 2 BNCs(m) to 3 alligator clips	HP PN 8120-1661
Tee, BNC(m)(f)(f) Adapter	HP PN 1250-0781 2 ea.

2. Set the multimeter to DCV.
3. Perform a SYSTEM RESET as described on page 1-4.
4. Move the cursor to the **BIAS** field, and set the DC bias level to 0 V.
5. Press the **DC BIAS** key to enable the DC Bias function.
6. Set the DC Bias voltage in accordance with Table 1-13, and confirm that the Multimeter readings are within the specified test limits listed in Table 1-13.

Table 1-13. DC Bias Level Test Limits

Bias Level	Test Limits
0 V	-0.0010 V to 0.0010 V
0.1 V	0.0989 V to 0.1011 V
2 V	1.9970 V to 2.0030 V
6 V	5.9920 V to 6.0080 V
14 V	13.981 V to 14.019 V
30 V	29.960 V to 30.040 V
40 V	39.950 V to 40.050 V
-0.1 V	-0.1011 V to -0.0989 V
-2 V	-2.0030 V to -1.9970 V
-6 V	-6.0080 V to -5.9920 V
-14 V	-14.019 V to -13.981 V
-30 V	-30.040 V to -29.960 V
-40 V	-40.050 V to -39.950 V

1-13. VOLTAGE RATIO MONITOR ACCURACY TEST (OPTION 002 ONLY)

This test verifies that the HP 4285A Voltage Ratio Monitor accuracy is within ± 1%. The accuracy is specified for an ambient temperature range of 23 °C ±5 °C.

NOTE

The detailed voltage ratio monitor specification is described in the HP 42851A Operation Manual.

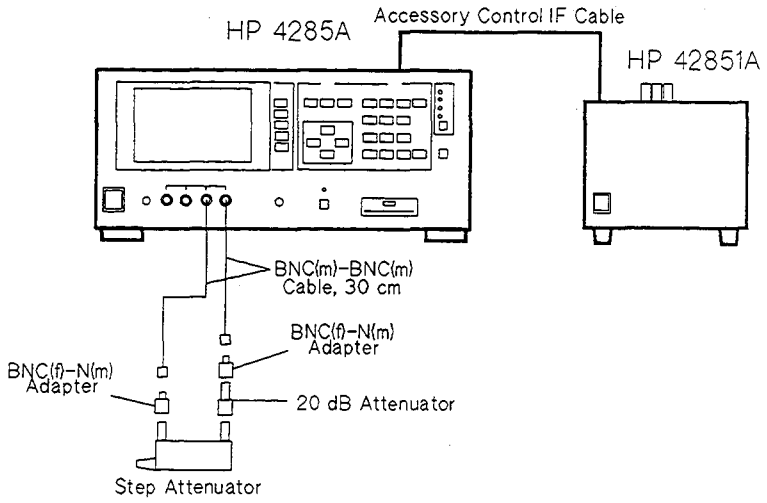


Figure 1-16. Voltage Ratio Monitor Accuracy Test Setup

EQUIPMENT:

Q Adapter	HP 42851A
Step Attenuator	HP 8495A Option 001, H04
20 dB Attenuator	HP 8491A Option 020
BNC(m)-BNC(m) Cable, 30 cm	HP PN 8120-1838, 2 ea.
BNC(f)-N(m) Adapter	HP PN 1250-0780

PROCEDURE:

1. Set up the equipment as shown in Figure 1-16. The HP 4285A is connected to the HP 42851A, using the Q Adapter Control Interface Cable.

2. Press the **CATALOG/SYSTEM MENU** key and the **'SYSTEM CONFIG'** softkey to display the **SYSTEM CONFIG** page.

3. Move the cursor to the **CONFIG** field, and press the **'Q Adapter'** softkey to set the HP 4285A to Q measurement mode.

4. Perform a SYSTEM RESET as described on page 1-4.

5. Press the **MEAS SETUP MENU** key to display the **MEAS SETUP** page.

6. Move the cursor and set the HP 4285A as follows.

   FREQ: 1 MHz
   TUNE: FIX-C
   LEVEL: 150 mV
   TRIG: MAN

7. Press the **DISPLAY FORMAT MENU** key to display the **MEAS DISPLAY** page.

8. Set the step attenuator to 0 dB.

9. Press the **TRIGGER** key, and record the Level Monitor Reading **(V)** in Calculation Sheet column [V_0].

NOTE

While in the Q measurement mode, the level monitor indicates approximately 60 times the value of the input voltage.

10. Set the step attenuator to 20 dB.

11. Record the Level Monitor Reading **(V)** in Calculation Sheet column [V_{20}].

12. Calculate the measured value 20 LOG(V_0/V_{20}), and confirm the value is within the following specified test limits.

    C.V. ± 0.086 [dB]

    C.V.:Step Attenuator 20 dB Calibration value at 1 MHz

13. Press the **CATALOG/SYSTEM MENU** key and the **'SYSTEM CONFIG'** softkey to display the **SYSTEM CONFIG** page.

14. Move the cursor to the **CONFIG** field, and press the **'OFF'** softkey to set the HP 4285A to Impedance measurement mode.

1-14. ACCESSORY CONTROL INTERFACE FUNCTION TEST (OPTION 002 ONLY)

This test verifies the Accessory Control Interface functions.

EQUIPMENT:

Bias Interface Simulator	HP PN 42841-65001
DC Power Supply	HP 6214C

PROCEDURE:

1. Set all switches of S1 and S2 on the bias interface simulator to '**1**' as shown in Figure 1-17.

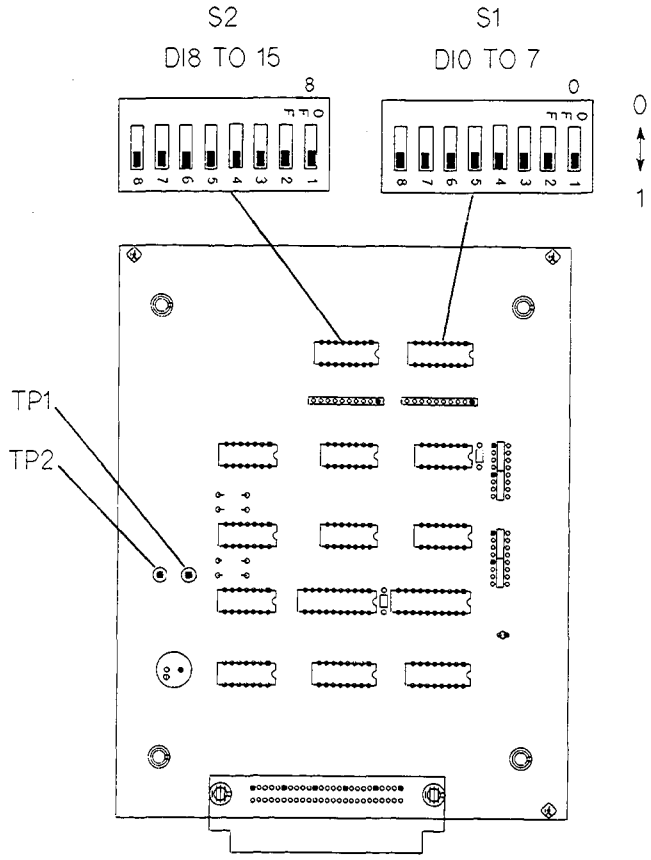


Figure 1-17. Bias Interface Simulator

2. Set DC power supply output voltage to +5 V. Connect TP2(GND) on the bias interface simulator to the '-' terminal of the power supply. Then connect TP1(Vcc) on the simulator to the '+' terminal of the power supply. (Refer to Figures 1-17 and 1-18)

NOTE

DC power for the bias interface simulator can be supplied from the HP 4285A instead of from an external DC power supply. For further details, see paragraph 1-18, SUPPLYING DC POWER TO THE SIMULATOR on page 1-44.

3. Interconnect the bias interface simulator and bias interface connector on the rear panel of the HP 4285A with the bias interface cable as shown in Figure 1-18.

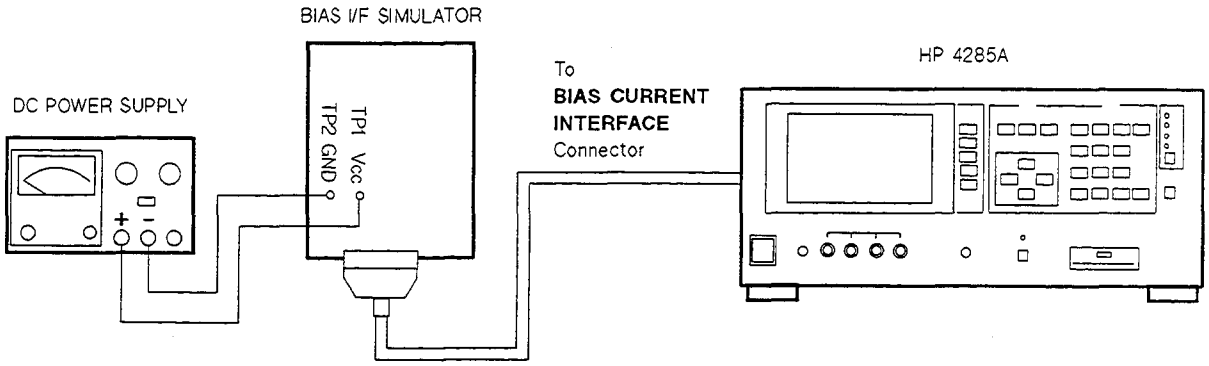


Figure 1-18. Accessory Control Interface Function Test Setup

4. Turn the HP 4285A ON.
5. Press the **CATALOG/SYSTEM MENU** key.
6. Press the **'SELF TEST'** softkey to display the **SELF TEST** page.
7. Move the cursor to the **TEST MENU** field, using the **CURSOR** arrow keys.
8. Press the **7** and the **ENTER** keys to select the **Accessory I/F I/O test.**

CAUTION

DO NOT EXECUTE ANY SELF TEST EXCEPT FOR THE BIAS CURRENT I/F I/O TEST OR THE HP 4285A WILL BECOME INOPERATIVE.

9. Press the **'TEST START'** softkey.

NOTE

Check the settings of S1 and S2 described in the Step 1, if the HP 4285A's LCD displays "E74:Illegal test setup".

10. Confirm that the /RESET LED on the bias interface simulator turns ON.

11. Confirm that the CS0 and CS1 LEDs on the simulator turn ON as the HP 4285A's output signal is displayed on the LCD. (Refer to Figure 1-19).

12. Confirm that ADRS1-ADRS6 LEDs on the simulator turn ON in accordance with the hexadecimal number displayed on the LCD. One of the 6 LEDs turns ON in sequence as shown in Figure 1-19.

13. Confirm that DO0-DO7 LEDs on the simulator turn ON in accordance with the hexadecimal number displayed on the LCD. One of the 8 LEDs turns ON in sequence as shown in Figure 1-19.

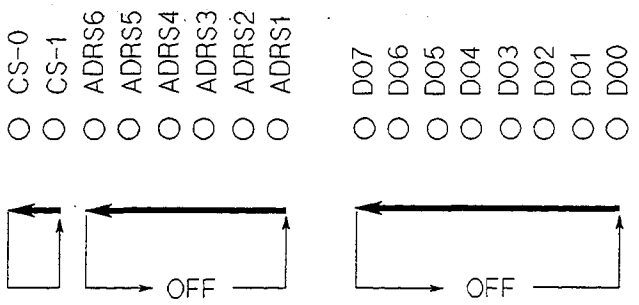


Figure 1-19. Accessory Control Interface Function Test

14. Confirm that "DI0 TO 7" and "DI8 TO 15" on the LCD of the HP 4285A display hexadecimal number "**FF**".

15. Set switches S1 and S2 on the bias interface simulator to '**0**'. Then confirm that hexadecimal number "**00**" is displayed by "DI0 TO 7" and "DI8 TO 15".

NOTE

The states of **S1** (DI0 TO 7) and **S2** (DI1 TO 8) are displayed as a hexadecimal number on the HP 4285A's LCD.

16. Press the **'TEST END'** softkey.

1-15. HANDLER INTERFACE FUNCTION TEST (OPTION 201 ONLY)

Perform this test only when troubleshooting the Option 201 Handler Interface Board.

This test verifies the Option 201 handler interface functions.

EQUIPMENT:

Handler Simulator	HP PN 04278-65001

PROCEDURE:

1. Disconnect the power cable from the HP 4285A and allow enough time (a few minutes), for the internal capacitors to discharge.

WARNING

DANGEROUS ENERGY/VOLTAGE EXISTS WHEN THE HP 4285A IS IN OPERATION, AND FOR A TIME AFTER IT IS POWERED DOWN. ALLOW A FEW MINUTES FOR THE INTERNAL CAPACITORS TO DISCHARGE.

2. Disconnect the two rear feet which lock the top cover and rear panel together.
3. Fully loosen the top cover retaining screws located on the rear of the top cover.
4. Slide the top cover toward rear and lift it off. The top shield plate will be visible.
5. Remove the top shield plate to expose the PC boards.
6. Disconnect the flat cable from the handler interface board, the board with **ORANGE** and a **RED** extractors. See Figure 1-20.

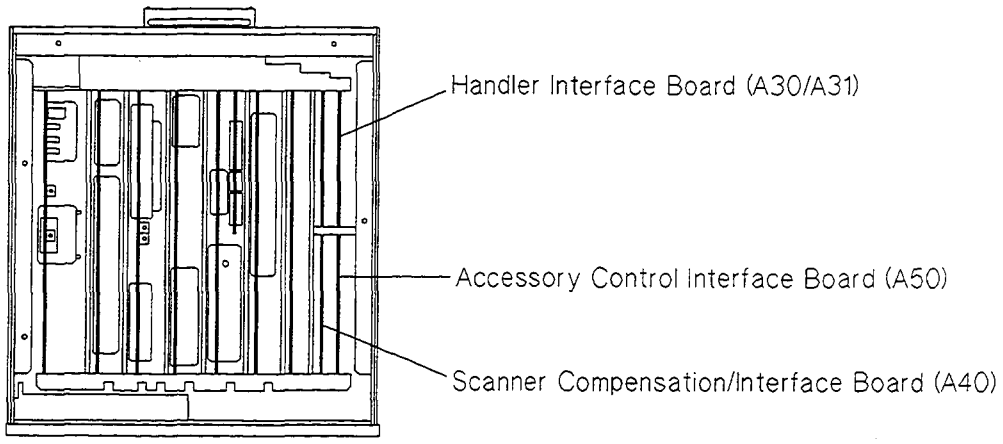


Figure 1-20. Interface Board Locations

7. Remove the handler interface board.

NOTE

Before performing step 8, make a note of the jumper settings so that you can return them to their original settings after you finish this test.

8. Set the jumpers on the handler interface board as shown in Figure in 1-21. Figure 1-21 shows the jumper settings when the board is shipped from the factory.

SET : All Jumper Switches to position "N"
OPEN (removed) : R101 thru R121

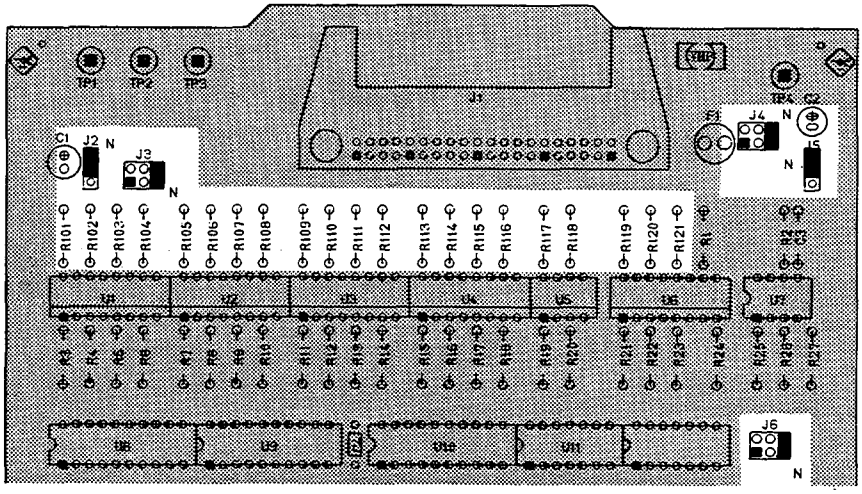


Figure 1-21. Jumper Settings

9. Replace the handler interface board, top shield plate, rear feet, and the top cover.

10. Turn the HP 4285A ON.

11. Connect a cable from the handler interface connector on the HP 4285A's rear panel to the handler simulator as shown in Figure 1-22.

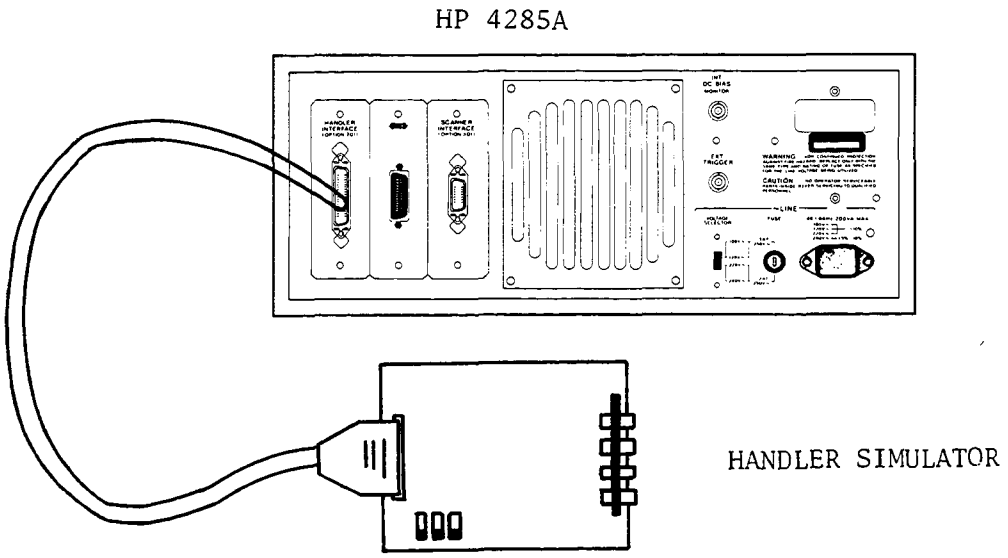


Figure 1-22. Handler Interface Function Test Set Up

12. Press the **CATALOG/SYSTEM MENU** key.
13. Press the **'SELF TEST'** softkey to display the **SELF TEST** page.
14. Use the **CURSOR** arrow keys to move the cursor to the **TEST MENU** field.
15. Press the **4** and the **ENTER** keys to select the **Handler I/F test**.
16. Press the **'TEST START'** softkey.
17. Confirm that the LEDs on the handler simulator turn ON in accordance with the HP 4285A's output signals displayed on the LCD. The LEDs turns ON in the sequence shown in Figure 1-23.

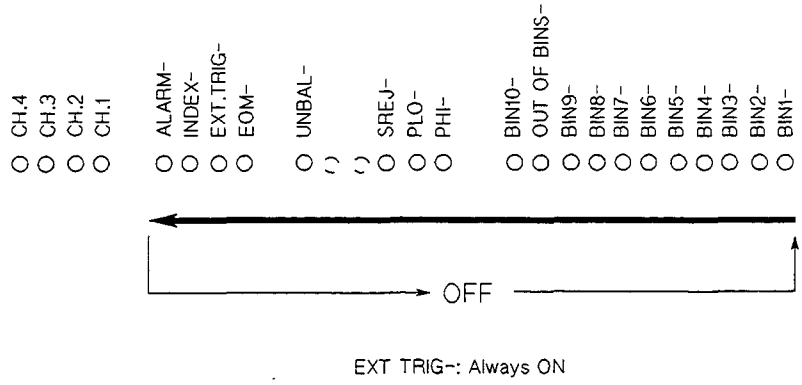


Figure 1-23. Handler Interface Function Check

18. Press the **'TEST END'** softkey.

CAUTION

DO NOT EXECUTE ANY SELF TEST EXCEPT FOR THE HANDLER I/F TEST OR THE HP 4285A WILL BECOME INOPERATIVE. THE REMAINING SELF TESTS ARE FOR SERVICE USE ONLY.

19. Return the jumper settings on the handler interface board to their original settings.

1-16. HANDLER INTERFACE FUNCTION TEST (OPTION 202 ONLY)

Perform this test only when troubleshooting the Option 202 handler interface board.

This test verifies the Option 202 handler interface functions. When this test is performed the following LEDs **WILL NOT** turn ON because the signals they represent are not used by the Option 202 handler interface board.

PHI-, PLO-, SREJ-, UNBAL- and **ALARM-**

EQUIPMENT:

Handler Simulator	HP PN 04278-65001
Cable	HP PN 04278-61635

PROCEDURE:

1. Perform steps 1 through 5 described on page 1-34.
2. Disconnect the flat cable from the handler interface board. The handler interface board has **ORANGE** and **BROWN** extractors and its location is shown in Figure 1-20 (page 1-34).
3. Remove the handler interface board.

NOTE

Before performing step 4, make a note of the jumper settings so that you can return them to there original settings at the end of this test.

4. Set the jumpers on the handler interface board as shown in Figure 1-24. (Figure 1-24 shows the jumper settings when the board is shipped from the factory.)

OPEN	W1, W4, W5, W7, W8, W11, W12
SHORT	W2, W3, W6, W9, W10, W13
OPEN (removed)	R101 thru R113

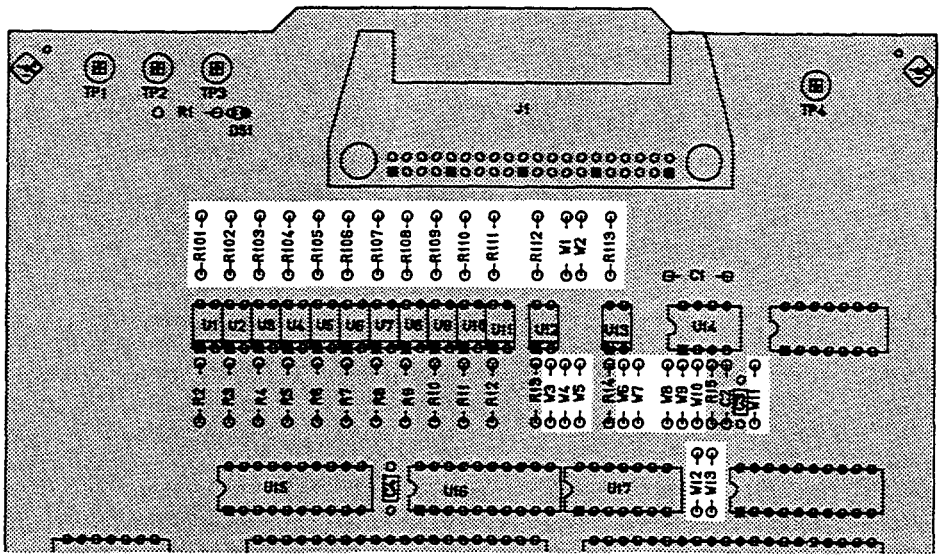


Figure 1-24. Jumper Settings

5. Replace the handler interface board, top shield board, rear feet, and the top cover.

6. Turn the HP 4285A ON.

7. Connect the handler interface connector on the HP 4285A's rear panel with the handler simulator as shown in Figure 1-25.

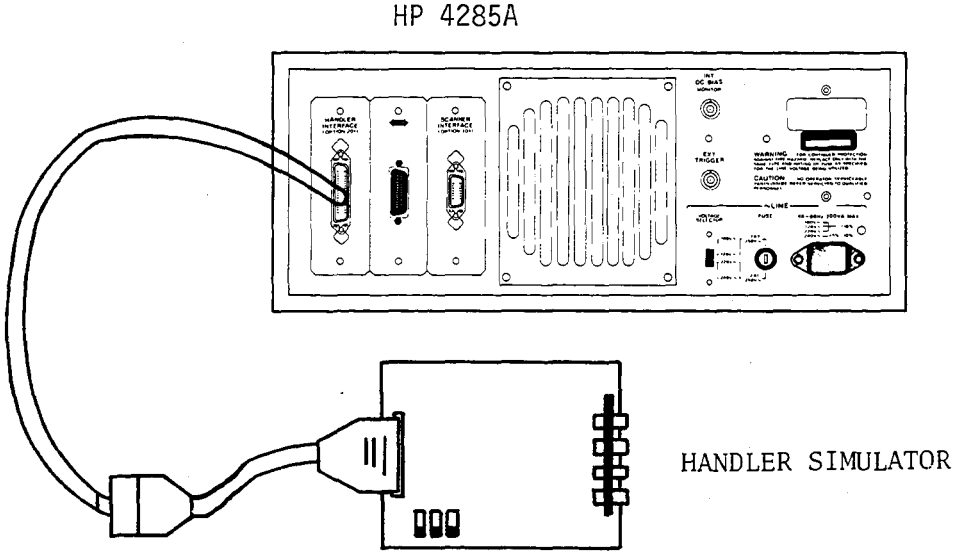


Figure 1-25. Handler Interface Function Test Set up

8. Press the **CATALOG/SYSTEM MENU** key.

9. Press the **'SELF TEST'** softkey to display the **SELF TEST** page.

10. Move the cursor to the **TEST MENU** field.

11. Press the **4** and **ENTER** keys to select the **Handler I/F test.**

12. Press the **'TEST START'** softkey.

13. Confirm that the LEDs on the handler simulator board turn ON in accordance with the HP 4285A's output signals displayed on the LCD. The LEDs should turn ON in the sequence shown in Figure 1-26.

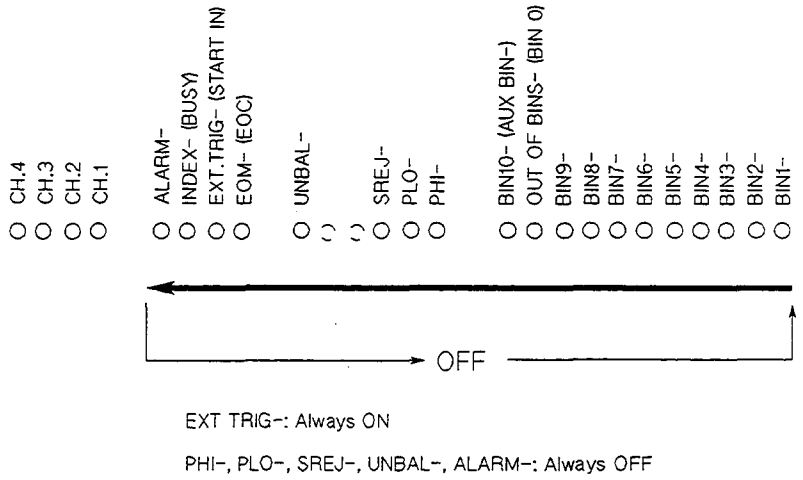


Figure 1-26. Handler Interface Function Check

14. Press the **'TEST END'** softkey.

CAUTION

DO NOT EXECUTE ANY SELF TEST EXCEPT FOR THE HANDLER I/F TEST OR THE HP 4285A WILL BECOME INOPERATIVE. THE REMAINING SELF TESTS ARE FOR SERVICE USE ONLY.

15. Return the jumper settings on the handler interface board to their original settings.

1-17. SCANNER INTERFACE FUNCTION TEST (OPTION 301 ONLY)

Perform this test only when troubleshooting the Option 301 scanner interface board.

This test verifies the Option 301 scanner interface function.

EQUIPMENT:

Scanner Simulator	HP PN 04278-65301
DC Power Supply	HP 6214C
Test Leads	

PROCEDURE:

1. Perform steps 1 through 5 described on pages 10-26.
2. Disconnect the flat cable from the scanner interface board. The scanner interface board has **BLACK** and **YELLOW** extractors and its location is shown in Figure 1-20 (page 1-34).
3. Remove the scanner interface board.
4. Set SW1 and SW2 on the scanner interface board as shown in Figure 1-27. Figure 1-27 shows the switches settings when the board is shipped from the factory.

NOTE

Before performing step 4, make a note of the switch settings so that you can return them to their same settings at the end of this test.

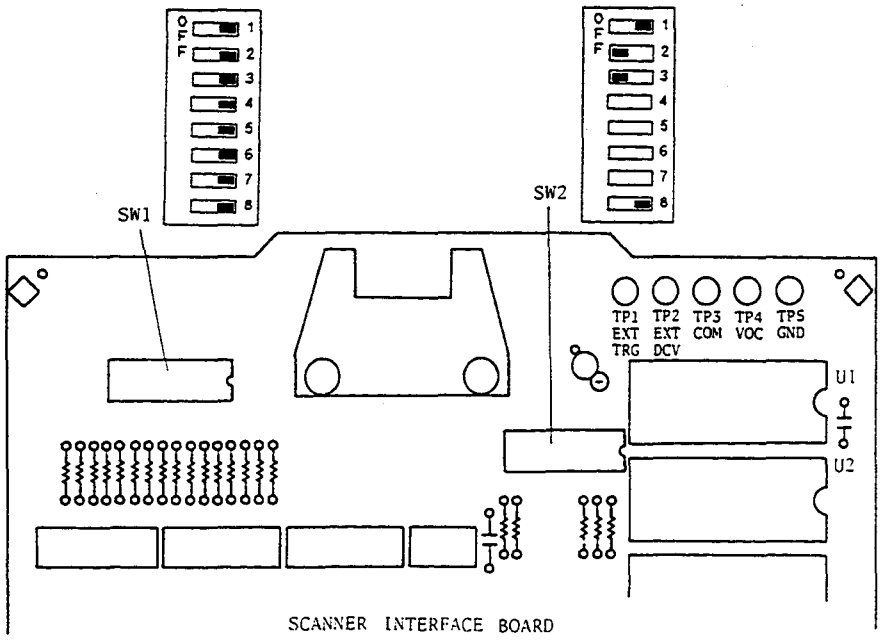


Figure 1-27. SW1 and SW2 Settings

5. Replace the scanner interface board and reconnect the flat cable.

6. Set the DC power supply output voltage to +5 V. Connect TP2(GND) on the bias interface simulator to '-' terminal of the power supply. Then connect TP1(Vcc) on the simulator to the '+' terminal of the power supply, refer to Figure 1-28.

NOTE

DC power for the bias interface simulator can be supplied by the HP 4285A instead of an external DC power supply. For further details, see paragraph 1-18, SUPPLYING DC POWER TO THE SIMULATOR on page 1-44.

7. Connect a cable from the scanner simulator to the scanner interface connector on the HP 4285A's rear panel as shown in Figure 1-28.

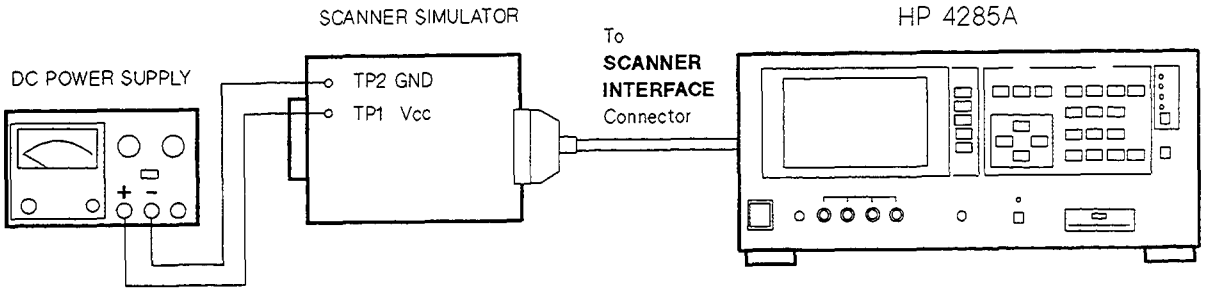


Figure 1-28. Scanner Simulator Connections

8. Turn the HP 4285A ON.
9. Press the **CATALOG/SYSTEM MENU** key.
10. Press the **'SELF TEST'** softkey to display the **SELF TEST** page.
11. Use the **CURSOR** arrow keys to move the cursor to the **TEST MENU** field.
12. Press the **6** and **ENTER** keys to select the **Scanner I/F I/O test**.
13. Press the **'TEST START'** softkey.
14. Confirm that LEDs on the scanner simulator board turn ON in accordance with the HP 4285A settings displayed in the LCD.
15. Press the **'TEST END'** softkey.

CAUTION

DO NOT EXECUTE ANY SELF TEST EXCEPT FOR THE ABOVE SELF TESTS OR THE HP 4285A WILL BECOME INOPERATIVE. THE REMAINING SELF TESTS ARE FOR SERVICE USE ONLY!

16. Set SW1 and SW2 on the scanner interface board to their original settings before this test.
17. Replace the top shield plate, rear feet, and top cover.

1-18. SUPPLYING DC POWER TO THE SIMULATOR

This paragraph describes the procedure for supplying +5 V DC to the Bias Interface Simulator or the Scanner Simulator from the internal circuits of the HP 4285A interior.

PROCEDURE:

1. Disconnect the power cable from the HP 4285A and allow enough time (a few minutes), for the internal capacitors to discharge.

WARNING

DANGEROUS ENERGY/VOLTAGE EXISTS WHEN THE HP 4285A IS IN OPERATION, AND FOR A TIME AFTER IT IS POWERED DOWN. ALLOW A FEW MINUTES FOR THE INTERNAL CAPACITORS TO DISCHARGE.

2. Disconnect the two rear feet which lock the top cover and rear panel together.
3. Fully loosen the top cover retaining screws located on the rear of the top cover.
4. Slide the top cover towards the rear and lift it off. The top shield plate will be visible.

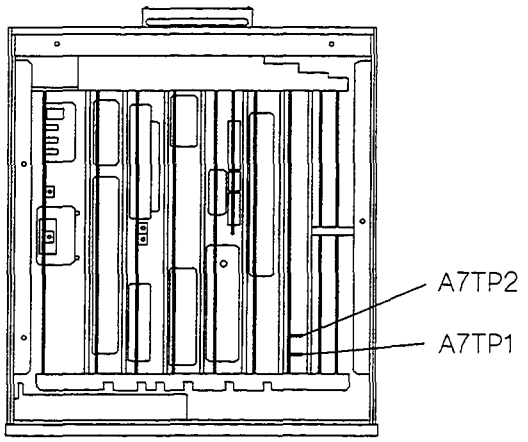


Figure 1-29. A7TP1 and A7TP2 Location

5. Connect TP2 (GND) on the A7 digital control board to the TP2 (GND) on the simulator board. Then connect TP1 on the A7 board to TP1 (5 V or Vcc) on the simulator board. Figure 1-29 shows the locations of A7TP1 and A7TP2.

CALCULATION SHEET

TEST SIGNAL LEVEL MONITOR ACCURACY TEST

Low Frequency Test

Test Frequency	Test Signal Level	Multimeter Reading [a]	Minimum Limit	Maximum Limit
100 kHz	1 V	_____[V]	a×0.958 _____[V]	a×1.042 _____[V]
1 MHz	20 mV	_____[mV]	a×0.956 _____[mV]	a×1.044 _____[mV]
1 MHz	100 mV	_____[mV]	a×0.956 _____[mV]	a×1.044 _____[mV]
1 MHz	1 V	_____[V]	a×0.956 _____[V]	a×1.044 _____[V]
1 MHz	2 V	_____[V]	a×0.956 _____[V]	a×1.044 _____[V]

High Frequency Test

Test Frequency	Power Meter Reading [a]	Measured Voltage $[b]=2\times\sqrt{0.05a}$	Minimum Limit	Maximum Limit
3 MHz	_____[mW]	_____[V]	b×0.952 _____[V]	b×1.048 _____[V]
10 MHz	_____[mW]	_____[V]	b×0.938 _____[V]	b×1.062 _____[V]
30 MHz	_____[mW]	_____[V]	b×0.898 _____[V]	b×1.102 _____[V]

IMPEDANCE MEASUREMENT ACCURACY TEST

10 pF Cal. Value [a]	10 pF Meas. Value [b]	Air Line Meas. Value [c]	Air Line Cal. Value [c]×[a]/[b]
_____[pF]	_____[pF]	_____[pF]	_____[pF]

VOLTAGE RATIO MONITOR ACCURACY TEST

Monitor Reading (V_0)	Monitor Reading (V_{20})	Measured Value 20LOG(V_0/V_{20})
_____[mV]	_____[mV]	_____[dB]

PERFORMANCE TEST RECORD

Hewlett-Packard HP 4285A
Precision LCR Meter

Tested by _____
Date _____
Serial No. _____

TEST SIGNAL FREQUENCY ACCURACY TEST

Test Frequency	Minimum	Measured Value	Maximum	Measurement Uncertainty
100 kHz	99.990 kHz	_____	100.010 kHz	0.0010 kHz
149 kHz	148.985 kHz	_____	149.015 kHz	0.0015 kHz
1 MHz	0.99990 MHz	_____	1.00010 MHz	0.00001 MHz
10 MHz	9.9990 MHz	_____	10.0010 MHz	0.00010 MHz
16 MHz	15.9984 MHz	_____	16.0016 MHz	0.00016 MHz
17 MHz	16.9983 MHz	_____	17.0017 MHz	0.00017 MHz
30 MHz	29.9970 MHz	_____	30.0030 MHz	0.00030 MHz

TEST SIGNAL LEVEL MONITOR ACCURACY TEST

Test Frequency	Test Signal Level	Minimum	Monitor Reading	Maximum	Measurement Uncertainty
100 kHz	1 Vrms	_____	_____	_____	0.001 Vrms
1 MHz	20 mVrms	_____	_____	_____	0.21 mVrms
1 MHz	100 mVrms	_____	_____	_____	1.01 mVrms
1 MHz	1 Vrms	_____	_____	_____	0.010 Vrms
1 MHz	2 Vrms	_____	_____	_____	0.021 Vrms
3 MHz	1 Vrms	_____	_____	_____	0.010 Vrms
10 MHz	1 Vrms	_____	_____	_____	0.011 Vrms
30 MHz	1 Vrms	_____	_____	_____	0.023 Vrms

TEST SIGNAL LEVEL ACCURACY TEST

Test Frequency	Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
100 kHz	1 Vrms	0.919 V	_____	1.081 V	0.042 V
1 MHz	5 mVrms	3.580 mV	_____	6.420 mV	0.210 mV
1 MHz	20 mVrms	17.32 mV	_____	22.68 mV	0.84 mV
1 MHz	100 mVrms	90.6 mV	_____	109.4 mV	4.2 mV
1 MHz	1 Vrms	0.915 V	_____	1.085 V	0.042 V
1 MHz	2 Vrms	1.831 V	_____	2.169 V	0.084 V
10 MHz	1 Vrms	0.88 V	_____	1.12 V	0.06 V
30 MHz	1 Vrms	0.80 V	_____	1.20 V	0.10 V
30 MHz	2 Vrms	1.60 V	_____	2.40 V	0.20 V

IMPEDANCE MEASUREMENT ACCURACY TEST

1 pF STANDARD (0 m) C.V. : _____ (Cal. Value at 1 MHz)

Test Frequency : 1 MHz

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
5 mV	C.V. -0.0399 pF -0.0399	_____ _____	C.V. +0.0399 pF 0.0399	0.00025 pF 0.0002
20 mV	C.V. -0.0113 pF -0.0113	_____ _____	C.V. +0.0113 pF 0.0113	0.00025 pF 0.0002
100 mV	C.V. -0.0037 pF -0.0037	_____ _____	C.V. +0.0037 pF 0.0037	0.00025 pF 0.0002
1 V	C.V. -0.0027 pF -0.0027	_____ _____	C.V. +0.0027 pF 0.0027	0.00025 pF 0.0002
2 V	C.V. -0.0022 pF -0.0022	_____ _____	C.V. +0.0022 pF 0.0022	0.00025 pF 0.0002

10 pF STANDARD (0 m) C.V. : _____ (Cal. Value at 1 MHz)

Test Frequency : 1 MHz

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
5 mV	C.V. -0.068 pF -0.0068	_____ _____	C.V. +0.068 pF 0.0068	0.0025 pF 0.0002
20 mV	C.V. -0.030 pF -0.0030	_____ _____	C.V. +0.030 pF 0.0030	0.0025 pF 0.0002
100 mV	C.V. -0.024 pF -0.0024	_____ _____	C.V. +0.024 pF 0.0024	0.0025 pF 0.0002
1 V	C.V. -0.024 pF -0.0024	_____ _____	C.V. +0.024 pF 0.0024	0.0025 pF 0.0002
2 V	C.V. -0.021 pF -0.0021	_____ _____	C.V. +0.021 pF 0.0021	0.0025 pF 0.0002

100 pF STANDARD (0 m) C.V. : _____ (Cal. Value at 1 MHz)

Test Frequency : 1 MHz

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
5 mV	C.V. -0.63 pF -0.0063	_____ _____	C.V. +0.63 pF C.V. +0.0063	0.025 pF 0.0002
20 mV	C.V. -0.22 pF -0.0022	_____ _____	C.V. +0.22 pF 0.0022	0.025 pF 0.0002
100 mV	C.V. -0.15 pF -0.0015	_____ _____	C.V. +0.15 pF 0.0015	0.025 pF 0.0002
1 V	C.V. -0.15 pF -0.0015	_____ _____	C.V. +0.15 pF +0.0015	0.025 pF 0.0002
2 V	C.V. -0.21 pF -0.0021	_____ _____	C.V. +0.21 pF 0.0021	0.025 pF 0.0002

1000 pF STANDARD (0 m) C.V. : _____ (Cal. Value at 1 MHz)

Test Frequency : 1 MHz

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
5 mV	C.V. -3.5 pF	_____	C.V. +3.5 pF	0.5 pF
	-0.0035	_____	0.0035	0.0002
20 mV	C.V. -1.5 pF	_____	C.V. +1.5 pF	0.5 pF
	-0.0015	_____	0.0015	0.0002
100 mV	C.V. -1.5 pF	_____	C.V. +1.5 pF	0.5 pF
	-0.0015	_____	0.0015	0.0002
1 V	C.V. -1.5 pF	_____	C.V. +1.5 pF	0.5 pF
	-0.0015	_____	0.0015	0.0002
2 V	C.V. -1.8 pF	_____	C.V. +1.8 pF	0.5 pF
	-0.0018	_____	0.0018	0.0002

20 cm AIR LINE (0 m) C.V. : _____ (Cal. Value at 1 MHz)

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Frequency	Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1.1 MHz	1 V	C.V. -0.032 pF -0.0023	_____ _____	C.V. +0.032 pF 0.0023	0.0072 pF 0.0005
1.1 MHz	2 V	C.V. -0.028 pF -0.0020	_____ _____	C.V. +0.028 pF 0.0020	0.0072 pF 0.0005
2 MHz	1 V	C.V. -0.030 pF -0.0022	_____ _____	C.V. +0.030 pF 0.0022	0.0076 pF 0.0005
2 MHz	2 V	C.V. -0.044 pF -0.0032	_____ _____	C.V. +0.044 pF 0.0032	0.0076 pF 0.0005
5 MHz	1 V	C.V. -0.051 pF -0.0037	_____ _____	C.V. +0.051 pF 0.0037	0.011 pF 0.0008
5 MHz	2 V	C.V. -0.047 pF -0.0034	_____ _____	C.V. +0.047 pF 0.0034	0.011 pF 0.0008
10 MHz	20 mV	C.V. -0.221 pF -0.0158	_____ _____	C.V. +0.221 pF 0.0158	0.023 pF 0.0016
10 MHz	100 mV	C.V. -0.114 pF -0.0082	_____ _____	C.V. +0.114 pF 0.0082	0.023 pF 0.0016
10 MHz	1 V	C.V. -0.114 pF -0.0082	_____ _____	C.V. +0.114 pF 0.0082	0.023 pF 0.0016
10 MHz	2 V	C.V. -0.100 pF -0.0072	_____ _____	C.V. +0.100 pF 0.0072	0.023 pF 0.0016
20 MHz	1 V	C.V. -0.246 pF -0.0176	_____ _____	C.V. +0.246 pF 0.0176	0.069 pF 0.0049
20 MHz	2 V	C.V. -0.281 pF -0.0201	_____ _____	C.V. +0.281 pF 0.0201	0.069 pF 0.0049
30 MHz	1 V	C.V. -0.536 pF -0.0383	_____ _____	C.V. +0.536 pF 0.0383	0.15 pF 0.0105
30 MHz	2 V	C.V. -0.509 pF -0.0364	_____ _____	C.V. +0.509 pF 0.0364	0.15 pF 0.0105

100 pF STANDARD (1 m) C.V. : _____ (Cal. Value at 1 MHz)

Test Frequency : 1 MHz

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1 V	C.V. -0.22 pF	_____	C.V. +0.22 pF	0.025 pF
	-0.0022	_____	C.V. 0.0022	0.0002
2 V	C.V. -0.28 pF	_____	C.V. +0.28 pF	0.025 pF
	-0.0028	_____	0.0028	0.0002

1000 pF STANDARD (1 m) C.V. : _____ (Cal. Value at 1 MHz)

Test Frequency : 1 MHz

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1 V	C.V. -2.1 pF	_____	C.V. +2.1 pF	0.5 pF
	-0.0021	_____	0.0021	0.0002
2 V	C.V. -2.5 pF	_____	C.V. +2.5 pF	0.5 pF
	-0.0025	_____	0.0025	0.0002

20 cm AIR LINE (1 m) C.V. : _____ (Cal. Value at 1 MHz)

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Frequency	Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
10 MHz	1 V	C.V. -0.208 pF	_____	C.V. +0.208 pF	0.023 pF
		-0.0149	_____	0.0149	0.0016
10 MHz	2 V	C.V. -0.194 pF	_____	C.V. +0.194 pF	0.023 pF
		-0.0139	_____	0.0139	0.0016
30 MHz	1 V	C.V. -0.816 pF	_____	C.V. +0.816 pF	0.15 pF
		-0.0583	_____	0.0583	0.0105
30 MHz	2 V	C.V. -0.789 pF	_____	C.V. +0.789 pF	0.15 pF
		-0.0564	_____	0.0564	0.0105

100 pF STANDARD (2 m) C.V. : _____ (Cal. Value at 1 MHz)

Test Frequency : 1 MHz

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1 V	C.V. -0.22 pF	_____	C.V. +0.22 pF	0.025 pF
	-0.0022	_____	0.0022	0.0002
2 V	C.V. -0.28 pF	_____	C.V. +0.28 pF	0.025 pF
	-0.0028	_____	0.0028	0.0002

1000 pF STANDARD (2 m) C.V. : _____ (Cal. Value at 1 MHz)

Test Frequency : 1 MHz

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
1 V	C.V. -2.1 pF	_____	C.V. +2.1 pF	0.5 pF
	-0.0021	_____	0.0021	0.0002
2 V	C.V. -2.5 pF	_____	C.V. +2.5 pF	0.5 pF
	-0.0025	_____	0.0025	0.0002

20 cm AIR LINE (2 m) C.V. : _____ (Cal. Value at 1 MHz)

Upper Value: Capacitance **(Cp)**
Lower Value: Dissipation Factor **(D)**

Test Frequency	Test Signal Level	Minimum	Measured Value	Maximum	Measurement Uncertainty
10 MHz	1 V	C.V. -0.208 pF	_____	C.V. +0.208 pF	0.023 pF
		-0.0149	_____	0.0149	0.0016
10 MHz	2 V	C.V. -0.194 pF	_____	C.V. +0.194 pF	0.023 pF
		-0.0139	_____	0.0139	0.0016
30 MHz	1 V	C.V. -0.816 pF	_____	C.V. +0.816 pF	0.15 pF
		-0.0583	_____	0.0583	0.0105
30 MHz	2 V	C.V. -0.789 pF	_____	C.V. +0.789 pF	0.15 pF
		-0.0564	_____	0.0564	0.0105

STORE AND LOAD FUNCTION TEST

PASS [ ] FAIL [ ]

HP-IB INTERFACE TEST

PASS [ ] FAIL [ ]

DC BIAS LEVEL ACCURACY TEST (OPTION 001 ONLY)

Bias Voltage	Minimum	Measured Value	Maximum	Measurement Uncertainty
0 V	-0.0010 V	_____	0.0010 V	0.001 mV
0.1 V	0.0989 V	_____	0.1011 V	0.011 mV
2 V	1.9970 V	_____	2.0030 V	0.022 mV
6 V	5.9920 V	_____	6.0080 V	0.062 mV
14 V	13.981 V	_____	14.019 V	0.198 mV
30 V	29.960 V	_____	30.040 V	0.390 mV
40 V	39.950 V	_____	40.050 V	0.510 mV
-0.1 V	-0.1011 V	_____	-0.0989 V	0.011 mV
-2 V	-2.0030 V	_____	-1.9970 V	0.022 mV
-6 V	-6.0080 V	_____	-5.9920 V	0.062 mV
-14 V	-14.012 V	_____	-13.988 V	0.198 mV
-30 V	-30.040 V	_____	-29.960 V	0.390 mV
-40 V	-40.050 V	_____	-39.950 V	0.510 mV

VOLTAGE RATIO MONITOR ACCURACY TEST (OPTION 002 ONLY)

C.V. (Step Attenuator 20 dB Cal.Value at 1 MHz):_____[dB]

Minimum	Measured Value	Maximum	Measurement Uncertainty
C.V.-0.086 dB	_____	C.V.+0.086 dB	0.022 [dB]

ACCESSORY CONTROL INTERFACE FUNCTION TEST (OPTION 002 ONLY)

PASS [ ] FAIL [ ]

APPENDIX A

MANUAL CHANGES

A-1.INTRODUCTION

This appendix contains the information required to adapt this manual to earlier versions or configurations of the HP 4285A than the current printing date of this manual. The information in this manual applies directly to HP 4285A Precision LCR Meters whose serial number prefix is listed on the title page of this manual.

A-2. MANUAL CHANGES

To adapt this manual to your HP 4285A, refer to Tables A and B, and make all of the manual changes listed opposite your instrument's serial number and ROM-based firmware's version.

Instruments manufactured after the printing of this manual may be different than those documented in this manual. Later instrument versions will be documented in a manual changes supplement that will accompany the manual shipped with that instrument. If your instrument serial number is not listed on the title page of this manual or in Table A, it may be documented in a **yellow MANUAL CHANGES** supplement.

Refer to the description of the ***IDN?** command in **CHAPTER 9, COMMAND REFERENCE, OPERATION MANUAL** for confirmation of the ROM-based firmware's version.

Table A. Manual Changes by Serial Number

Serial Prefix or Number	Make Manual Changes
	There are no earlier configurations than the printing date of this manual.

Table B. Manual Changes by Firmware's Version

Version	Make Manual Changes
	There are no earlier versions than the printing date of this manual.

NOTES

REGIONAL SALES AND SUPPORT OFFICES

For more information about Agilent Technologies test and measurement products, applications, services, and for a current sales office listing, visit our web site: http://www.agilent.com/find/tmdir. You can also contact one of the following centers and ask for a test and measurement sales representative.
11/29/99

United States:
Agilent Technologies
Test and Measurement Call Center
P.O.Box 4026
Englewood, CO 80155-4026
(tel) 1 800 452 4844

Canada:
Agilent Technologies Canada Inc.
5150 Spectrum Way
Mississauga, Ontario
L4W 5G1
(tel) 1 877 894 4414

Europe:
Agilent Technologies
Test & Measurement
European Marketing Organization
P.O.Box 999
1180 AZ Amstelveen
The Netherlands
(tel) (31 20) 547 9999

Japan:
Agilent Technologies Japan Ltd.
Call Center
9-1, Takakura-Cho, Hachioji-Shi,
Tokyo 192-8510, Japan
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Latin America:
Agilent Technologies
Latin American Region Headquarters
5200 Blue Lagoon Drive, Suite #950
Miami, Florida 33126
U.S.A.
(tel) (305) 267 4245
(fax) (305) 267 4286

Australia/New Zealand:
Agilent Technologies Australia Pty Ltd
347 Burwood Highway
Forest Hill, Victoria 3131
(tel) 1-800 629 485 (Australia)
(fax) (61 3) 9272 0749
(tel) 0 800 738 378 (New Zealand)
(fax) (64 4) 802 6881

Asia Pacific:
Agilent Technologies
24/F, Cityplaza One, 1111 King's Road,
Taikoo Shing, Hong Kong
(tel) (852)-3197-7777
(fax) (852)-2506-9284